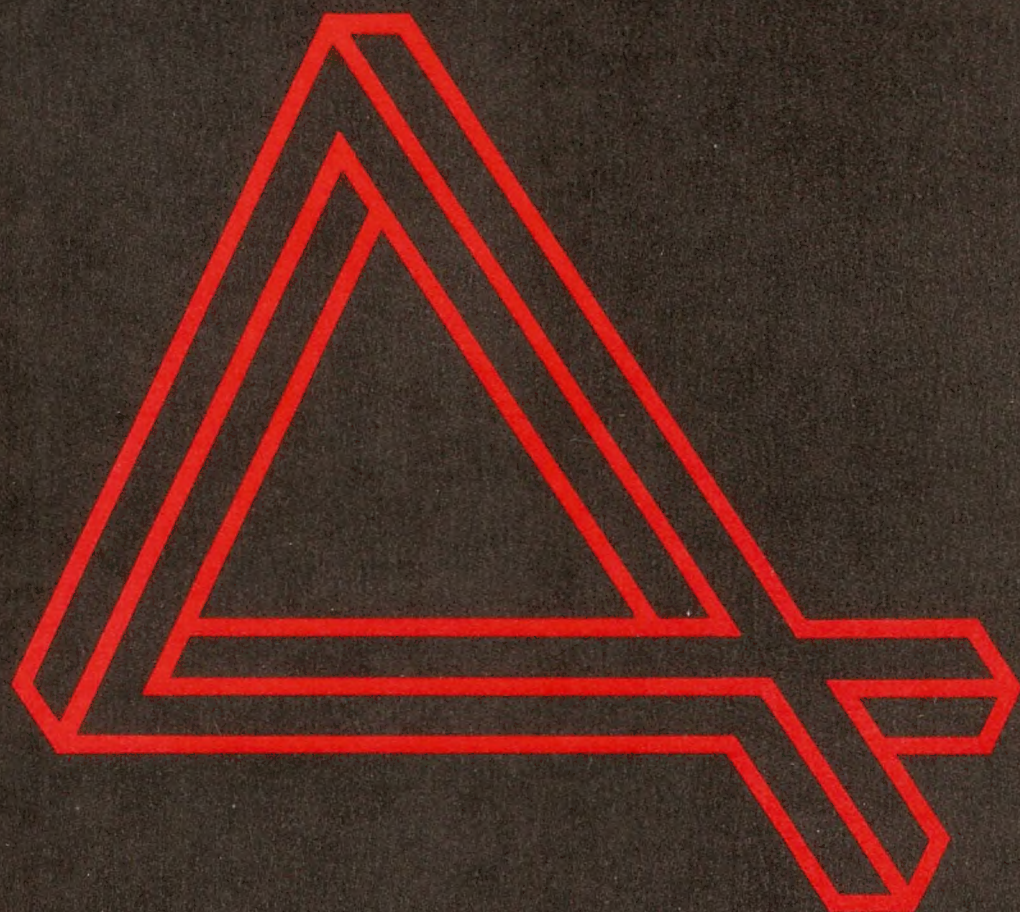


DESIGN REFERENCE

4th DIMENSION[®]

AGV



Binder 1

Ver 2.1

4th DIMENSION DESIGN REFERENCE

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DESIGN

PREFACE



4th DIMENSION is a powerful relational database application and development tool for Apple's family of Macintosh computers.

You can use 4th DIMENSION to manage your own data or develop custom applications for different kinds of database management tasks.

For example you can

- Create a database structure of files and fields.
- Design layouts for entering, modifying, and displaying records.
- Search and sort records.
- Create reports and labels from information in the databases.
- Import and export data between 4th DIMENSION databases and other applications.

With 4th DIMENSION, you can enhance conventional data management tasks with these features:

- The powerful Layout editor that works like a full-featured drawing program to let you add object-oriented graphics and fonts to your layouts.
- The capacity to store graphics in database files.
- A password access system to protect sensitive data.
- Graphing functions that let you generate a variety of business graphs from your data.
- The capability to create custom applications from 4th DIMENSION with your own custom menus, dialog boxes, and buttons.
- A full-featured programming language that lets you incorporate procedures written in other languages.

4th DIMENSION's flexibility and power makes it ideal for a complete range of information management tasks. Novice users can quickly create databases and begin managing their data. Experienced users without programming experience can customize their databases with 4th DIMENSION's development tools. More experienced developers can use 4th DIMENSION's powerful programming language to add sophisticated features and capabilities to their databases, including file transfer and communications.

When you design a custom database with 4th DIMENSION, all the components of the Macintosh's user interface are at your disposal. You can add menus, dialog boxes, buttons, and windows to enhance your databases and make users more productive.

About the Manuals

The *4th DIMENSION Design Reference* is a reference guide to 4th DIMENSION's Design environment and provides detailed descriptions of 4th DIMENSION operations that you can perform in this environment. You should use it in conjunction with the other volumes in your documentation package.

The *4th DIMENSION Quick Start* and *4th DIMENSION Tutorials* lead you through example lessons where you create and use a 4th DIMENSION database. These examples provide hands-on experience and help you become familiar with the concepts and features of 4th DIMENSION.

The *4th DIMENSION User Reference* provides a description of the environment where you will use the databases and layouts to enter and manipulate data.

The *4th DIMENSION Language Reference* is a guide to using the 4th DIMENSION language. Use this manual to learn how to use the language to customize a database.

The *4th DIMENSION Utilities Guide* provides a guide to the utilities available with 4th DIMENSION, such as 4D Tools, 4D Customizer, and 4D External Mover.

The *4th DIMENSION Glossary and Master Index* provides a glossary that defines terms and an index to all 4th DIMENSION documents.

About This Manual

This manual describes 4th DIMENSION Design environment. The Design environment is where you create a database, before you enter data into records. This manual assumes that you are familiar with basic Macintosh operations, such as clicking, double-clicking, and choosing a menu command. To use the *Design Reference* effectively, you should

- Use the *Quick Start* and *Tutorials* volumes to work through the database examples as needed.
- Begin creating your own databases, referring to the *Design Reference* and *User Reference* when you need to review a procedure or explanation.
- Refer to the other manuals as needed.

Chapter Descriptions

This manual is divided into ten chapters:

- Chapter 1, “4th DIMENSION Basics,” introduces you to basic 4th DIMENSION operations, such as starting, manipulating desktop files, and using the File and Edit menus. It also describes all of the environments, and it contains an overview of all the editors in the Design environment.
- Chapter 2, “Designing a Database Structure” introduces the Structure editor and explains how to create files, fields, and related files.
- Chapter 3, “Creating and Modifying Layouts,” introduces the Layout editor and explains how to create layouts. It covers how to create any kind of graphic object and how to change the appearance of any object.
- Chapter 4, “Designing the Interface,” explains how to use 4th DIMENSION’s powerful layout design features to create a custom interface for a database that includes various field display formats, active objects such as buttons and pop-up menus, scripts, and layouts that display information from other files.
- Chapter 5, “Creating Report Layouts,” explains how to create a layout for printing a report. It includes how to create subtotals and other summary calculations using scripts.
- Chapter 6, “Creating Procedures,” introduces the two 4th DIMENSION Procedure editors. It explains how to use both the Listing Procedure editor and the Flowchart Procedure editor to create procedures and scripts.
- Chapter 7, “Creating Custom Menus,” explains how to use the Menu editor to create custom menus.
- Chapter 8, “Managing Password Access,” explains how to use the Password Access editor to create a system to control access to files, layouts, procedures, and menu items.
- Chapter 9, “Creating Lists,” explains how to create lists with the Lists editor, and how to use lists during data entry.
- Chapter 10, “4th DIMENSION Special Topics,” provides information about specialized topics, such as how to set 4th DIMENSION for multi-user operation, how to update structure and data files, and so on.

Aids to Understanding

This manual, and the other manuals in your documentation package, uses visual aids to help you understand the material.

Here are some examples of the visual aids in the manual:



Note: Text emphasized like this provides annotations and shortcuts that will help you become more productive with 4th DIMENSION.



Important: Notes like this alert you to important pieces of information.



Warning: Warnings like this alert you to situations where data might be lost.



4th DIMENSION BASICS

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4th DIMENSION BASICS

This chapter provides basic information about 4th DIMENSION and the Design environment. The chapter includes

- instructions for starting 4th DIMENSION
- instructions for handling 4th DIMENSION desktop files
- instructions for backing up 4th DIMENSION files
- instructions for duplicating 4th DIMENSION databases
- a description of the three 4th DIMENSION environments
- an overview of the Design environment editors you use to create a database
- instructions for performing standard 4th DIMENSION operations with menus, windows, and lists
- instructions for setting preferences for 4th DIMENSION

Starting 4th DIMENSION

When you start 4th DIMENSION you can either create a new database or open an existing one.

Creating a New Database

If you want to start 4th DIMENSION and create a new database, follow these steps:

1. Double-click the 4th DIMENSION application icon. Or select the 4th DIMENSION application icon and choose Open from the File menu. 4th DIMENSION displays the welcome screen, as shown in Figure 1-1.



4th DIMENSION
database folder



Figure 1-1
Welcome screen

If no 4th DIMENSION databases exist in the same folder as the application, no filenames appear in the list of files, and the Open button is disabled.

2. Click New.

4th DIMENSION displays a create-file dialog box so that you can enter the filename for the new database.

3. Type a database name and click Save.

You can use any valid Macintosh filename of up to 25 characters.

Although you can't see the operation, 4th DIMENSION creates a folder for the new database and also creates the Macintosh files it needs to maintain the database, as shown in Figure 1-2. The name of the folder is your database name with an "f" at the end. 4th DIMENSION saves the Macintosh files in this folder.

4th DIMENSION displays the Structure window for the new database. The Structure window displays the image of the first database file, as shown in Figure 1-2. You can now begin adding fields and creating additional files to create the database structure.

See Chapter 2 for detailed information about creating a database structure.

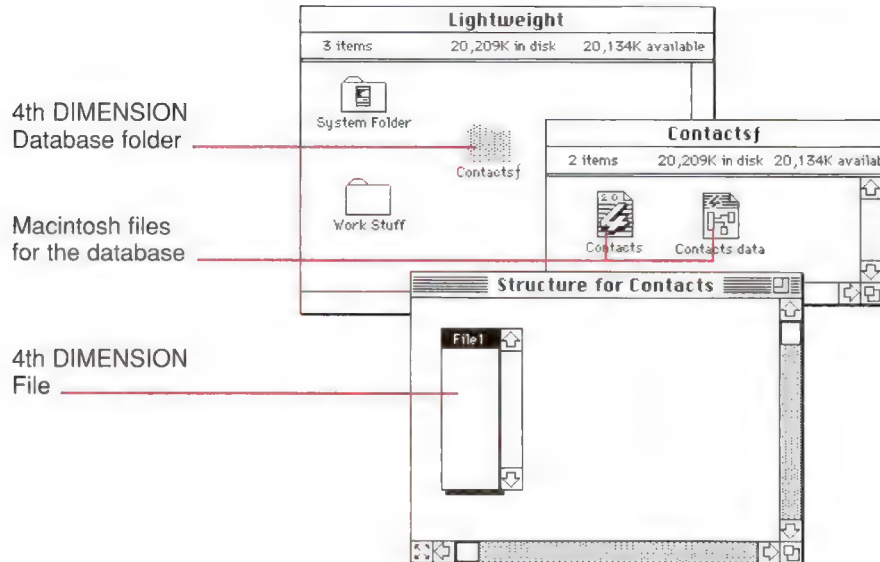


Figure 1-2
Macintosh files and a 4th DIMENSION file image

Opening an Existing Database

If you are starting 4th DIMENSION and want to open an existing database, follow these steps:

1. Double-click the 4th DIMENSION application icon. Or select the 4th DIMENSION application icon and choose Open from the File menu.

4th DIMENSION displays the welcome screen. The screen contains a file list from which you can choose the filename of the database you want.

If the database you want to open is not in the same folder as the application, change folders (or disk drives) until the desired folder appears in the window.

2. Select the database you want and click Open.

If a password is required, you are prompted to enter your password. The database opens in the environment you previously specified in the Preferences dialog box.



Note: You can open any 4th DIMENSION database by double-clicking either of its icons in the Finder.

4th DIMENSION Desktop Files

4th DIMENSION creates two files for each database: a structure file and a data file. They are initially placed together in a new folder when the database is created. You may want to put these files in different locations.

The structure file contains all the specifications for the database structure (files, fields, field attributes), layouts, procedures, menus, password access groups, and lists. The data file contains the data that has been entered into records. When first created, of course, both files are empty.

Each file has a name that identifies whether it is a structure file or a data file. The structure file has the same name as the database. The data file's name is the database name followed by ".data". Figure 1-3 shows both files from a database.

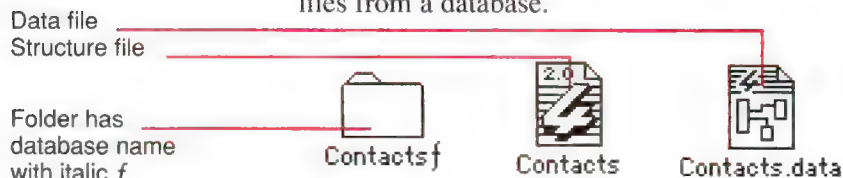


Figure 1-3
Structure and data files

If you open a 4th DIMENSION structure file, the application opens the data file that has the same name as the structure file followed by ".data". If the application cannot find the data file, the "Open data file" dialog box

appears so that you can select the data file you want to use or create a new data file. Figure 1-4 shows the “Open data file” dialog box.

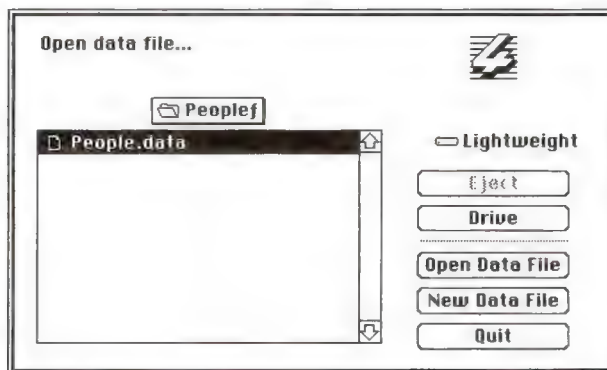


Figure 1-4
The “Open data file” dialog box

You can use any 4th DIMENSION data file with any structure file. The data file does not have to have the same name as the structure file. The data in the data file must be compatible with the structure you want to use. That is, the data must fit into the fields, the number of fields in the structure must be at least as large as the number in the data file, and the data must agree with the field types.

If you create a new data file, 4th DIMENSION opens the database using the original structure but with no records.

When you use a different data file or a new data file with a structure file, 4th DIMENSION records the path to that data file. The path specifies the location of a file. For example, a file may be located on the Mydisk hard disk, in a folder named Databases which contains the folder Contactsf and the Contacts and Contacts.data files. The path to the Contacts.data file is Mydisk:Databases:Contactsf:Contacts.data. Once you have used the “Open data file” dialog box to locate a data file for a particular database, 4th DIMENSION subsequently opens the same data file automatically, as long as it remains in the same path.

If you move the data file again, you will need to locate it again.



Note: If you hold down the Option key while opening any database, 4th DIMENSION displays the “Open data file” dialog box so that you can choose a different data file or create a new one.

Duplicating a 4th DIMENSION Database

You can create a clone (an exact copy) of any 4th DIMENSION database structure simply by duplicating the 4th DIMENSION structure file for that database. You can also create a copy of the information in the database by duplicating the data file. Figure 1-5 shows duplicated structure and data files.

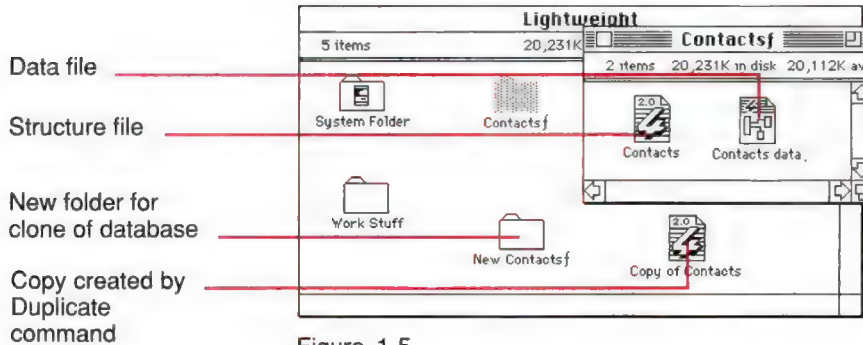


Figure 1-5
Cloning a database

There are two ways to duplicate files. Here is the first method:

1. In the Finder, select the structure file you want to duplicate.
2. Choose Duplicate from the File menu.

The Macintosh creates a new file with "Copy of..." inserted before the filename. This file contains a copy of the original database structure.

If you want a duplicate of the information as well, duplicate the data file also.

Here is the second method:

1. Create a new folder to hold the duplicate database.
2. Hold down the Option key while you drag the structure file's icon into the new folder.

The Macintosh puts a copy of the file into the new folder, leaving the original in its own folder.

If you want a duplicate of the information as well, duplicate the data file also.



Note: If you duplicate the structure, move it to another folder, and double-click it, it still opens the original data file. However, if you duplicate both files and place them in the same folder, double-clicking the duplicate structure file opens the duplicate data file.

Making Back Ups

As you work on databases it is a good idea to develop a consistent method of backing up your work. Unexpected interruptions, such as a power failure or computer failure, can damage a database. Although 4th DIMENSION and 4D Tools can usually recover your database after such damage, having a backup is wise insurance.

After you have been working in the Design environment, you should make a copy of the structure file (the file without a suffix). After you have been entering or modifying data, you should make a copy of the data file (the file with the *.data* suffix). You can use either of the methods described in the previous section to copy the files.

Once a database is in use, the data file changes as new records are added and old records are modified. If a database is used infrequently, with perhaps only a few changes each day, backing up the data file once a week or even less often is probably sufficient. If a database is heavily used, a more structured backup system is needed. For example, the following system may be used:

1. Make a backup at the end of each day. Use five separate disks, tapes or other media, one for each day.
2. At the end of the week, store the last backup permanently in a safe place.
3. Reuse the first four backups from the previous week for the next week's backups.

A backup system like the one above ensures that you always have at least five backup copies available.

The Environments

You work with 4th DIMENSION in a series of environments. Each environment is a system of editors, windows, and pull-down menus that allow you to perform database operations. There are three environments:

- Design
- User
- Runtime

The Design Environment

The Design environment is where you create a database. This environment provides editors that you use to build and modify a database. Use the Design environment to

- create database files in which to store data
- create layouts for entering, displaying, and printing data
- write procedures for performing calculations, manipulating data, and executing menu commands
- create custom menus for executing procedures or controlling a runtime application (a stand-alone application based on 4th DIMENSION)
- set up a system of passwords to control access to databases, files, layouts, menus, and procedures
- create lists of choices that simplify and control data entry

Figure 1-6 shows the Design environment being used to create a database. Complete information about each of the Design environment features is found in this book.

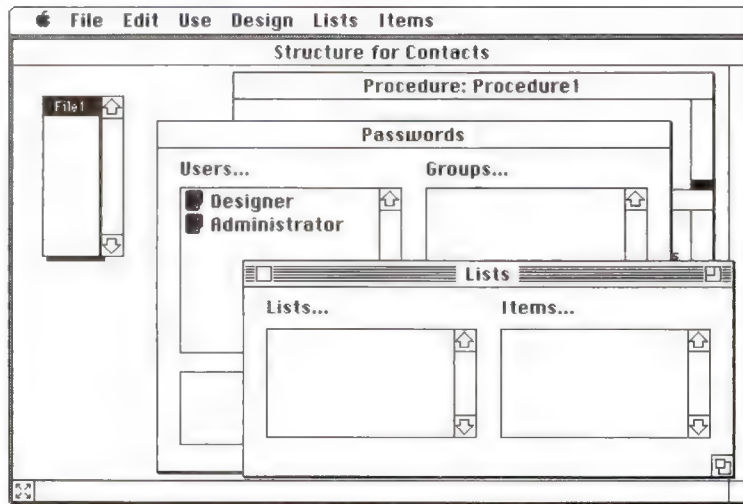


Figure 1-6
The Design environment

The User Environment

The User environment is where you enter and manage data after you've created a database structure in the Design environment. The User environment is used for

- entering and modifying data
- viewing and printing data
- searching and sorting records in the database files
- creating reports and labels
- creating graphs
- importing and exporting data
- executing procedures

Figure 1-7 shows the User environment

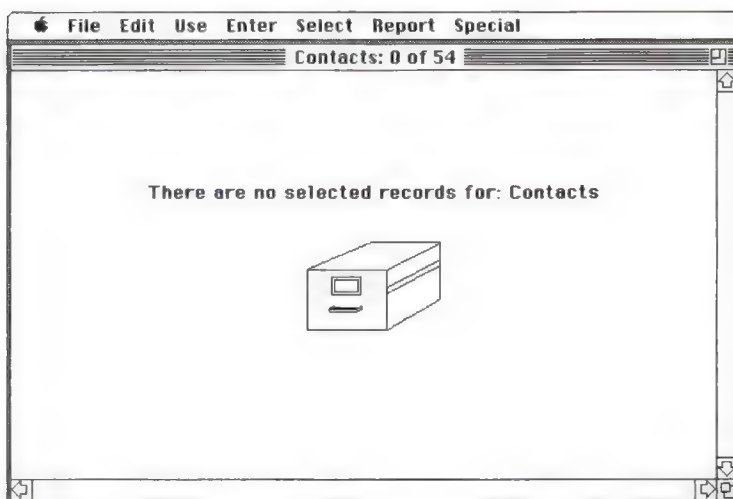


Figure 1-7
The User environment

The Runtime Environment

The Runtime environment is a special environment that is used to run a custom application—an application that uses 4th DIMENSION but has its own menu system and screen design. It is called the Runtime environment because you can use a database designed for this environment with 4th DIMENSION Runtime, a low-cost version of 4th DIMENSION used to run, but not create, 4th DIMENSION databases.

You create a runtime application in the Design environment. You control everything about the runtime application, from the menus and layouts it uses to the procedures necessary to accept, process, and display data.

The Runtime environment can be completely different for each application you create. From the user's standpoint, the Runtime environment is a complete application for a specific kind of information management.

Figure 1-8 shows a sample Runtime environment window displaying an application created with 4th DIMENSION.

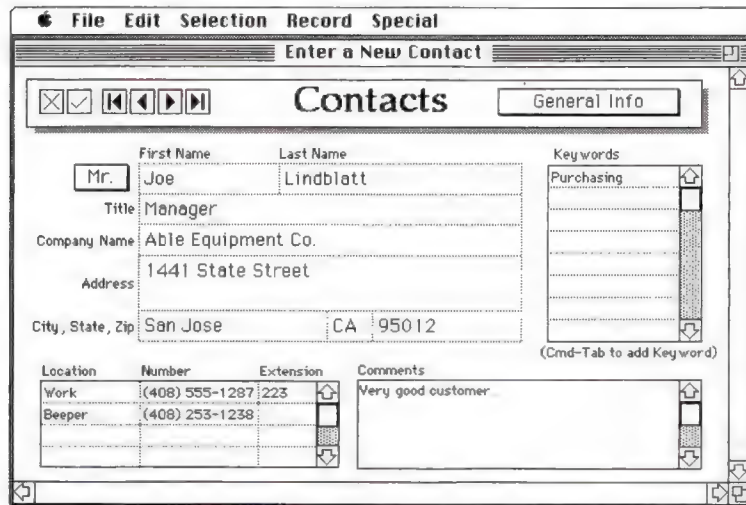


Figure 1-8
An application in the Runtime environment

Changing Environments

You change from one environment to another by choosing a command from the Use menu. A check mark in the menu indicates which environment you are in.

You can move between the Design and User environments at any time. Once you have created a custom menu, you can enter the Runtime environment from either the Design or the User environment. If no custom menu exists, the Runtime choice in the Use menu is disabled.

From within the Runtime environment, choosing Quit takes you to the User environment.



Design Environment Editors

You use 4th DIMENSION editors to create and modify the various components of your database design. Each editor is dedicated to one aspect of a design.

The Design environment contains these editors:

- Structure editor
- Layout editor
- Procedure editors
- Menu editor
- Password Access editor
- Lists editor

Each editor has its own window, with appropriate tools and menu commands.

The Structure Editor

The Structure editor is your starting point for all design operations.

The Structure editor displays the images of the files in a database and graphically shows the relationships (if any) between the files. Figure 1-9 shows the Structure window.

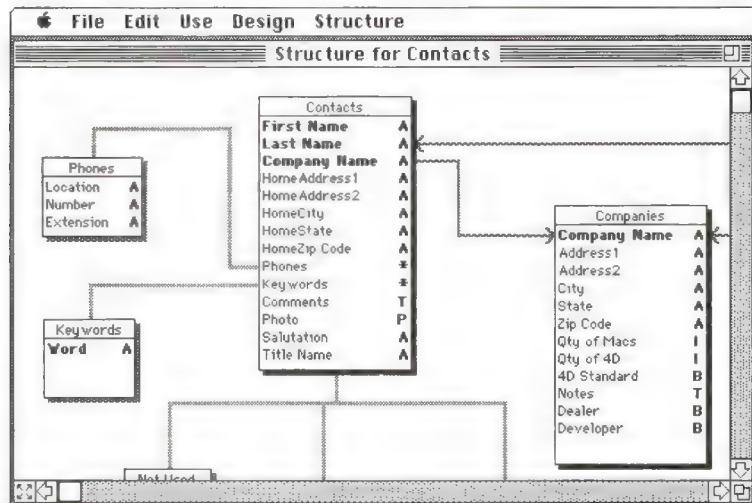


Figure 1-9
Structure editor

Use the Structure editor to

- create files and subfiles in a database
- create fields and subfields in database files
- specify field types and attributes
- relate files
- modify filenames and field names
- establish the access rights to files
- view the file structure of a database

See Chapter 2 for more information on using the Structure editor.

The Layout Editor

You use the Layout editor to create and modify layouts—forms for entering, searching, and displaying the contents of your databases. Almost an application by itself, the Layout editor lets you create sophisticated forms for managing data. Figure 1-10 shows the Layout editor being used to create a layout.

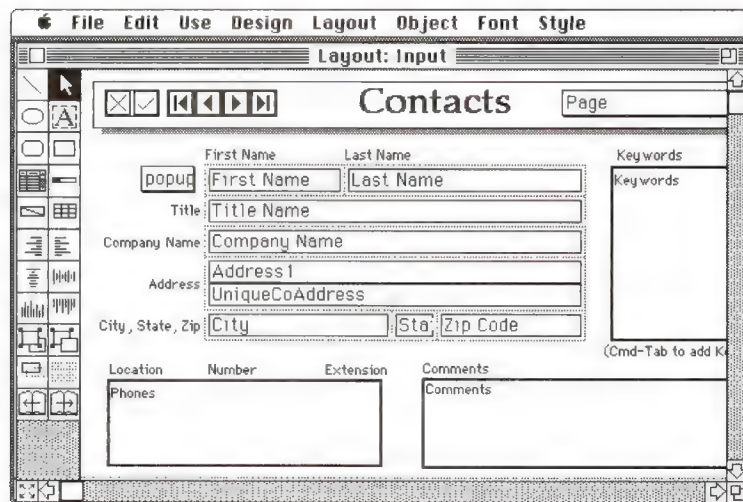


Figure 1-10
Layout editor

Use the Layout editor to

- add fields to a layout
- include fields and layouts from other files and subfiles in a layout
- add graphic objects to the layout—including text, lines, rectangles, and ovals, or paste in pictures or graphics from the scrapbook
- edit and manipulate layout elements
- add objects that make the layout easier to use—for example, buttons, check boxes, and radio buttons
- specify fonts and font styles for objects that contain text
- specify line and fill patterns for layout objects
- align objects on the layout
- specify display formats for data displayed and entered in the layout
- establish access rights to each layout

See Chapter 3 for a detailed discussion of how to create a layout and how to use the Layout editor's graphic features. See Chapter 4 for information about using the Layout editor to control the interface of the database: display formats, data entry, and scripts. See Chapter 5 for information about using the Layout editor to design a report.

The Procedure Editors

Procedures are programming instructions that process the information in files. Procedures can perform computations on values in the files, transfer data between files, or validate data as it is entered. Procedures are especially important for developing runtime applications.

4th DIMENSION provides a high-level programming language for writing these procedures, two different Procedure editors, and a library of commands and functions.

The two 4th DIMENSION procedure editors are the Listing editor and the Flowchart editor. Each of these editors can be used to create procedures. The choice of which to use is up to you and depends on which editor you prefer to work with. Chapter 6 describes the use of each editor. Figure 1-11 and Figure 1-12 show both editors being used to create procedures.

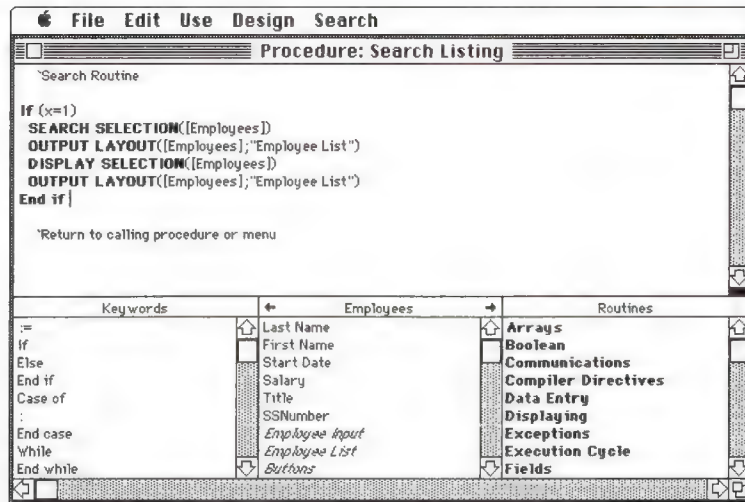


Figure 1-11
Procedure editor (listing)

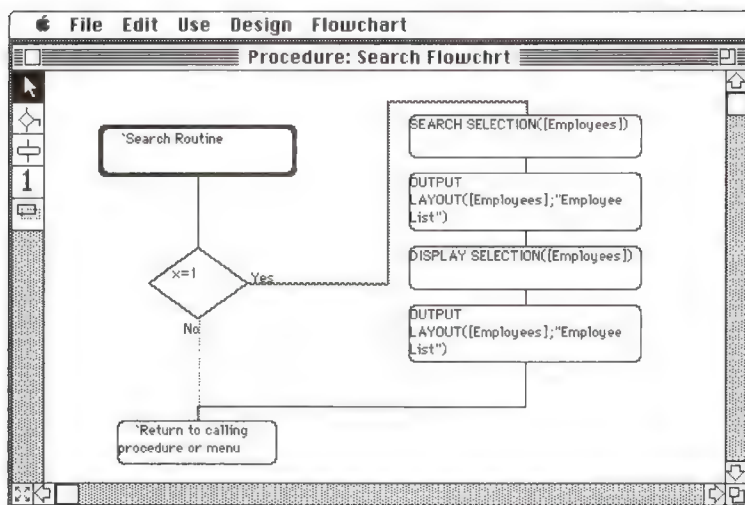


Figure 1-12
Procedure editor (flowchart)

Use either Procedure editor to

- create global procedures for custom menus
- create layout procedures for specified layouts
- create file procedures for managing database files
- create scripts that are associated with individual layout objects
- establish access rights to procedures

See Chapter 6 for more information on writing procedures. See the *4th DIMENSION Language Reference* for comprehensive information about the language you use to write procedures.

The Menu Editor

When you create runtime applications with 4th DIMENSION, you use the Menu editor to create menu bars, menus, and menu items. You can also attach menus to any layout that you use for data entry. Figure 1-13 shows the Menu editor being used to create a menu bar.

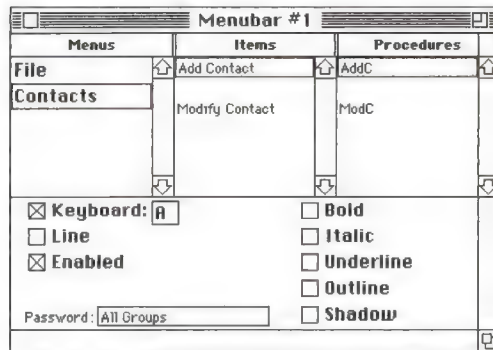


Figure 1-13
Menu editor

Use the Menu editor to

- create menu bars
- create and modify custom menu titles and menu items
- assign global procedures to menu items
- preview the menus and menu bars as they will appear in the finished application
- include graphic elements for screens that display with each menu bar
- establish access rights to menu items
- set keystroke equivalents for commands in your custom menus
- enable or disable menu items

See Chapter 7 for a detailed discussion of adding custom menus and menu bars to your applications.

The Password Access Editor

4th DIMENSION lets you add passwords to files, procedures, menus, and layouts so that you can control access to your applications and databases. Figure 1-14 on the following shows the Password Access editor.

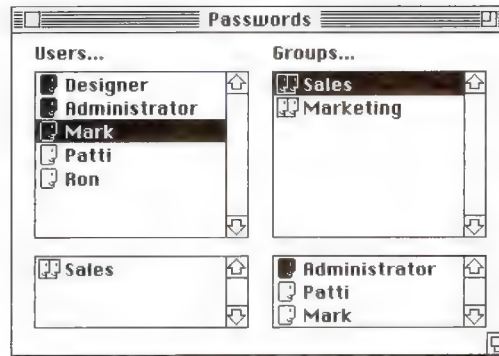


Figure 1-14
Password Access editor

Use the Password Access editor to

- create access groups and user passwords
- allow designated people to add users and change user passwords
- set startup procedures for users
- prevent application users from entering 4th DIMENSION Design and User environments
- monitor database use by individual users
- review and modify user passwords

See Chapter 8 for a detailed discussion of the Password Access editor.

The Lists Editor

You use the Lists editor to create and modify lists. Lists make the entry and management of data easier. Users can select an entry from a list instead of typing. With lists, you prevent entry of misspelled words and incorrect data.

You can also use lists to specify valid or invalid entries for a field. Figure 1-15 shows the Lists editor being used to create a list.

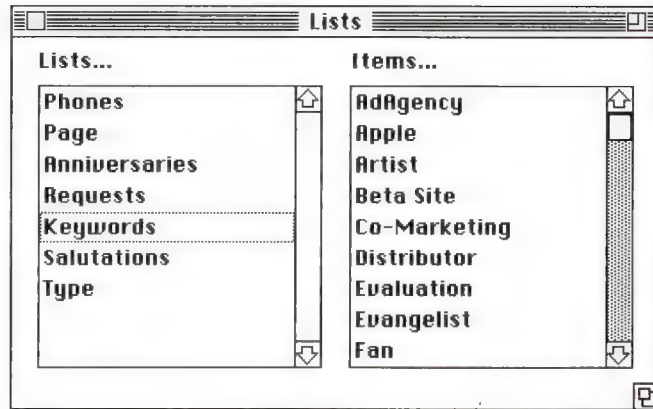


Figure 1-15
Lists editor

Use the Lists editor to

- create lists
- add items to a list
- delete lists or individual items in a list
- sort choices in a list
- connect lists to other lists
- make a list modifiable by the user

See Chapter 9 for a detailed discussion of lists.

The 4th DIMENSION Interface

In the Design environment, you communicate with 4th DIMENSION by means of a comprehensive and consistent system of menus and windows. You can collapse and expand hierarchical lists and use lists to select from different files in dialog boxes. This section describes how to use the menus, windows, hierarchical lists, and file displays in dialog boxes.

4th DIMENSION Menus

The five leftmost menus on the 4th DIMENSION menu bar remain the same no matter which editor you are using. Additional menus are added to the right side of the menu bar for each editor. The added menus provide commands for the editor being used. Figure 1-16 shows the additional menus added when the Lists editor is open.

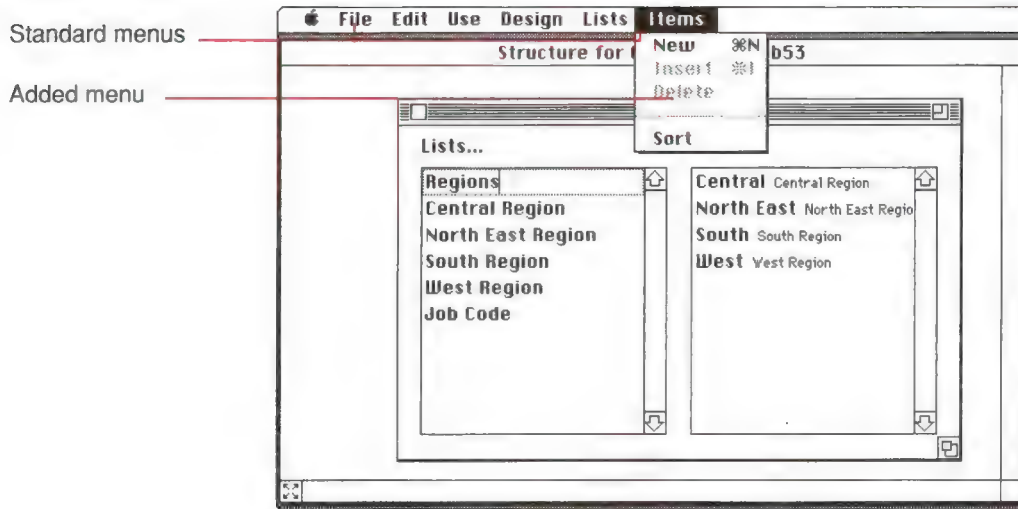


Figure 1-16
Menus added to the menu bar

When several editor windows are open, the active editor determines which menus are added to the menu bar. You choose commands from these menus as you would in any Macintosh application. For complete instructions for choosing from a menu, see the documentation that came with your Macintosh.

4th DIMENSION Editor Windows

Each 4th DIMENSION editor is displayed in a separate window. There may be several editor windows open at once. You can have more than one editor open at one time, and some of the editors can display several windows at the same time. A list of open windows is displayed at the bottom of the Design menu, as shown in Figure 1-17.

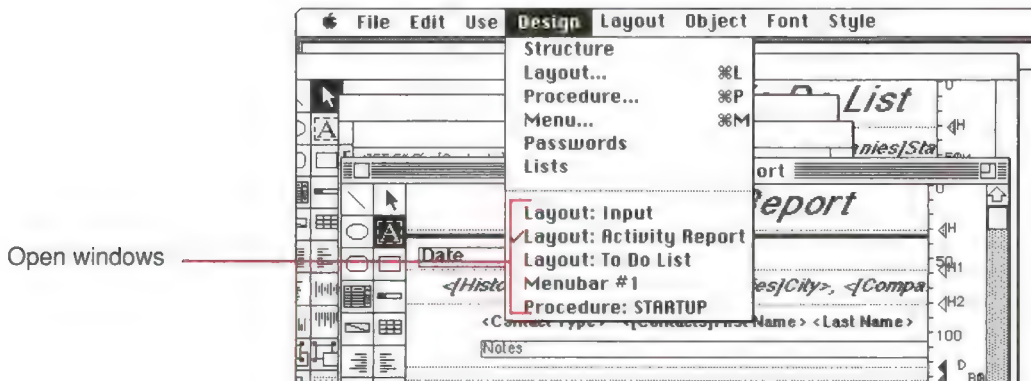


Figure 1-17
Design menu listing open windows

You can move between the open windows as you work. Only one editor window is active at any time. The active editor determines which menus are added to the right of the menu bar.

To make a window active you can click anywhere in the window, or you can choose the window's name from the the Design menu. Figure 1-18 shows several windows open on the screen.

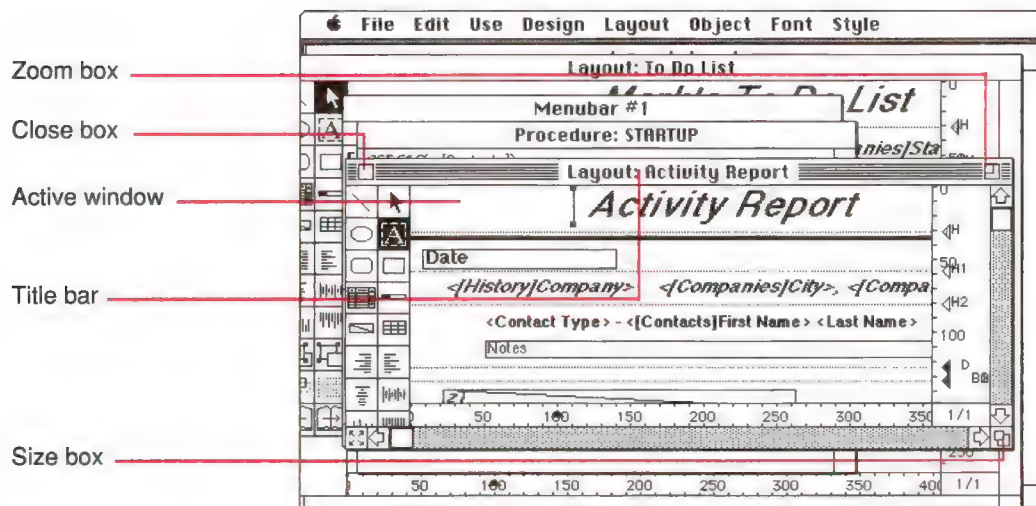


Figure 1-18
Open windows

You can move a window anywhere on the screen by dragging its title bar.

You can expand the window to full-screen size by clicking the zoom box in the upper-right corner of the window. You can make the window any size you want by dragging the size box in the lower-right corner of the window.

You can close a window by clicking the close box in the upper-left corner of the window, or by choosing *Close Editorname* from the File menu.



Tip: To close all the open windows (except the Structure editor window), hold down the Option key as you click the close box of the active window.

You work with windows in 4th DIMENSION the same way as in most Macintosh applications. For complete instructions for manipulating windows, see the documentation that came with your Macintosh.

Reduced View and Scrolling

As you build a database, the design in some of the editors can become so large that it is difficult to view the entire structure, layout, or flowchart.

You can scroll to change your view of the window's contents, or you can click the Show Page box to show a reduced view.

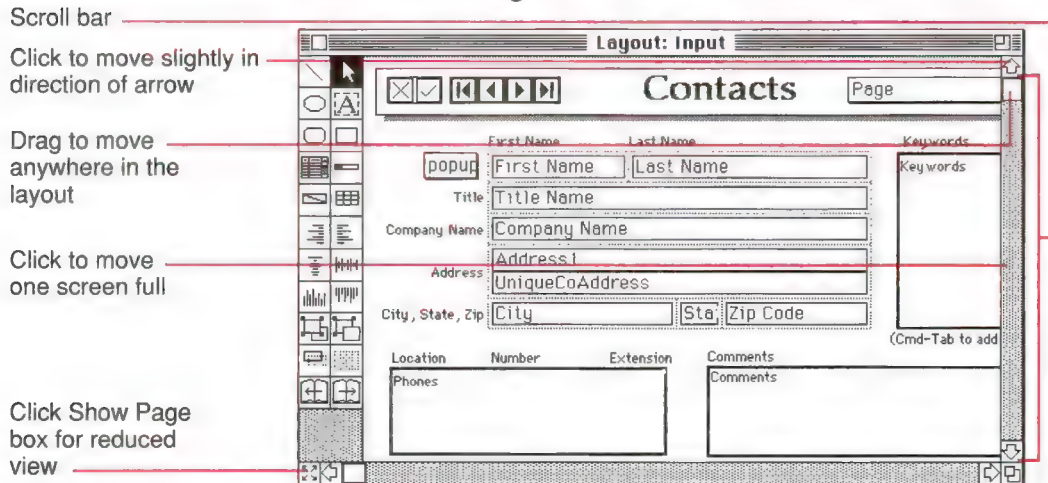


Figure 1-19
Scrolling to move hidden material into view

You scroll the window as you would in any Macintosh application. For complete instructions for scrolling, see the documentation that came with your Macintosh.

When you click the Show Page box, 4th DIMENSION reduces the view of the structure, layout, or flowchart so you can see the entire contents at a glance. A dotted-line rectangle identifies the portion of the contents that currently appears in the editor window. To specify a new view area for the window, drag this rectangle to where you want it, and click OK. Figure 1-20 shows a reduced view of the Structure window.

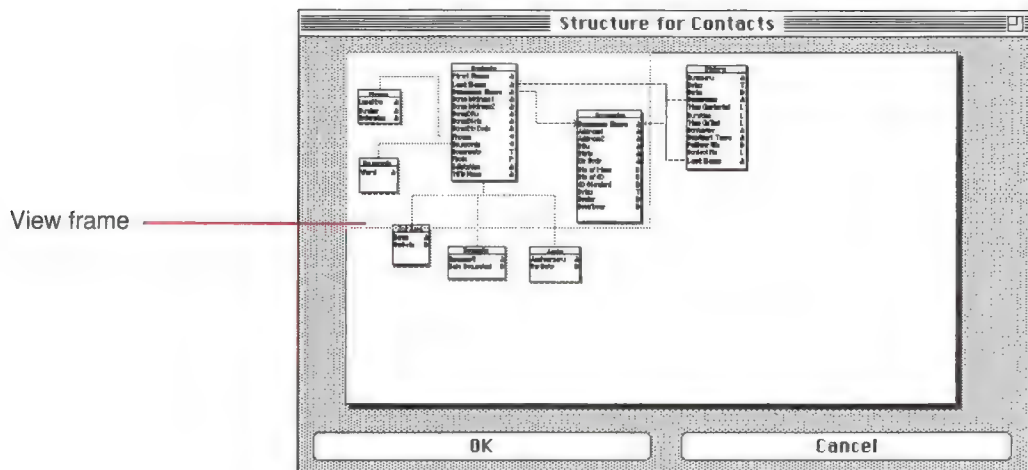


Figure 1-20
Reduced view of a database structure

Expanding and Collapsing Hierarchical Lists

4th DIMENSION displays names of fields, layouts, and procedures in hierarchical lists in dialog boxes. All of the hierarchical lists in 4th DIMENSION work the same way. Whenever an item in a list is displayed in bold, additional items may exist beneath that item. You expand a list to choose one of the items, and you collapse the list if you need room to view another part of the list.

Figure 1-21 shows a hierarchical list with expanded and collapsed items.

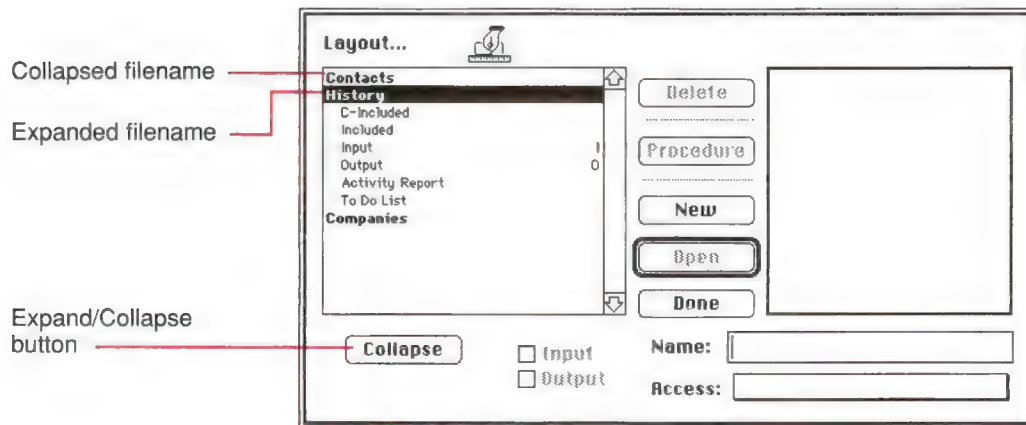


Figure 1-21
Collapsed and expanded filenames

To expand a list item, follow these steps:

1. Select the item that you want to expand.

You can click the item or use the Up Arrow and Down Arrow keys to highlight other items on the list.

2. Click Expand, or press the Right Arrow key.

4th DIMENSION displays the names of all available fields, layouts, or procedures for a selected item.

When a selected item is expanded, the Expand button becomes a Collapse button.

To collapse a list item, follow these steps:

1. Select the item that you want to collapse.

You can click the item or use the Up and Down Arrow keys to highlight other items on the list.

2. Click Collapse, or press the Left Arrow key.

4th DIMENSION collapses the names of the fields, layouts, or procedures and shows only the filename.

When a selected item is collapsed, the Collapse button becomes an Expand button.



Note: You can expand a collapsed item, or collapse an expanded one, by double-clicking the item.

Displaying a Different File

In some dialog boxes, 4th DIMENSION allows you to select field names and layout names from lists. To select a field name or layout name from another file, you can change the file displayed. You change the file by clicking one of the cycle arrows on either side of the filename bar.

Figure 1-22 shows the cycle arrows used to display a different file.

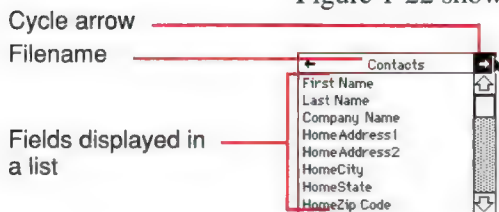


Figure 1-22
Cycling to display another file

Click either arrow to cycle through the files in the database.
 4th DIMENSION displays files in the order in which they were created.
 When you cycle through all the files, the first file is displayed again.



Tip: If you click on the filename between the cycle arrows and hold the mouse button down for a moment, a pop-up menu of all the files is displayed. You can then choose one of the filenames to immediately switch to that file.

The File and Edit Menus

The File and Edit menus on the left side of the Design environment menu bar provide standard file and editing operations appropriate for the active editor. The File menu changes slightly, depending on which editor is active.

Using the File Menu

In the Design environment, 4th DIMENSION's File menu provides standard Macintosh file operations. Figure 1-23 shows the File menu.

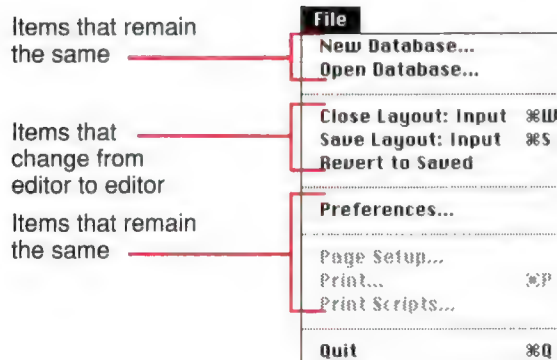


Figure 1-23
 The File menu that appears when the Layout editor is active

Some File menu commands remain the same for every editor:

- **New Database:** You can create a new database at any time. 4th DIMENSION saves changes to the current database before opening the new database.
- **Open Database:** You can open an existing database at any time. 4th DIMENSION saves changes to the current database before opening the next database.
- **Preferences:** You can set preferences at any time. For complete information, see “Setting Preferences,” later in this chapter.
- **Page Setup:** You can set the specifications for printing at any time. Page Setup information is stored with each layout.

- **Print:** You can print the contents of any editor window at any time. The actual output changes, depending on the editor.
- **Quit:** You can quit 4th DIMENSION at any time. 4th DIMENSION saves your work before quitting.

Other File menu commands change, depending on the active editor:

- **Close *Editorname*:** You can close editor windows at any time. 4th DIMENSION saves the contents of the window before closing it. You cannot close the Structure editor window.
- **Save *Editorname*:** You can save the contents of an editor's window at any time without closing the window. 4th DIMENSION automatically saves the contents of an editor when you close the window, change to a new environment, or quit the application.
- **Revert to Saved:** You can revert to the last saved version of the contents of the Layout editor or either of the Procedure editors. This command replaces the contents of the active editor with the last version saved.
- **Print Scripts:** Using the Layout editor, you can attach scripts—short procedures—to objects in the layout. The Print Scripts command allows you to print scripts associated with one or more objects in a layout. You first select the objects whose scripts you want to print, then you choose Print Scripts. For information about creating scripts, see “Scripts” in Chapter 4.

Using the Edit Menu

In the Design environment, 4th DIMENSION's Edit menu provides standard Macintosh editing operations. Figure 1-24 shows the Edit menu.

Edit	
Undo	⌘Z
Cut	⌘H
Copy	⌘C
Paste	⌘V
Clear	
Select All	⌘A
Show Clipboard	

Figure 1-24
The Edit menu

These are the operations provided by the Edit menu:

- **Undo:** Use Undo to go back one step while working with an editor. This command is useful when you make a mistake and want to do something over again.
- **Cut, Copy, Paste:** You can select something on the screen and either cut or copy it. In either case, a copy of the selected object is placed on the Clipboard. You can then paste the object into a new location in the same window or in another window.
- **Clear:** Use Clear to erase a selected object. No copy is placed on the Clipboard.
- **Select All:** Use Select All to select every object in the current editor. For example, use Select All before adjusting all the elements of a layout.
- **Show Clipboard:** You can view the current contents of the Clipboard at any time. Sometimes you'll want to view the Clipboard prior to pasting its contents.

Setting Preferences

You can set preferences for database operations—for example, how often data should be saved, and whether procedure titles should be printed when you print procedures. You set preferences only in the Design environment, and the settings apply only to the current database.

The specifications that you select in the Preferences dialog box take effect immediately, except for those that cannot take effect until the database is opened again (such as Startup Environment). Figure 1-25 shows the Preferences dialog box.

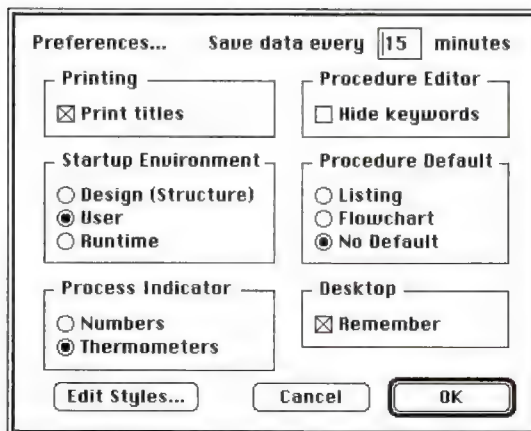


Figure 1-25
Preferences dialog box

Here are the items in the Preferences dialog box:

- **Save data every...minutes:** Specify a time period for saving data automatically.

4th DIMENSION saves your data at regular intervals. You can specify any time interval between 1 and 120 minutes. As a default, 4th DIMENSION saves your data every 15 minutes. The application also saves your data each time you change to another environment or quit the application.

When you anticipate entering a lot of data, consider setting a brief time period between saves. In case of a power failure, you will lose only the data entered since the previous save.

If each save involves a long pause for disk activity, it's a sign that you should adjust the setting. The long pause means that 4th DIMENSION is saving many records to disk. A briefer period between saves is thus more efficient.

- **Printing:** Select whether to print procedure titles.

Unless you specify otherwise, 4th DIMENSION automatically prints procedure titles. If you deselect the "Print titles" check box, 4th DIMENSION omits the title when printing a procedure. See Chapter 6 for more information on creating and editing procedures.

- **Procedure Editor:** Select whether to hide keywords in 4th DIMENSION's Listing Procedure editor.

Unless you specify otherwise, 4th DIMENSION automatically displays keywords, fields and layouts from each file, and 4th DIMENSION routines in scrollable lists in the Listing editor. If you select the "Hide keywords" check box 4th DIMENSION displays the Listing Procedure editor with the lists hidden. You can bring them into view by dragging the window divider. See Chapter 6 for more information on the Listing Procedure editor.

- **Startup Environment:** Select the environment in which you want the database to open.

Unless you specify otherwise, 4th DIMENSION automatically opens the database in the Design environment.

- **Procedure Default:** Specify a default Procedure editor for creating scripts and certain other procedures.

4th DIMENSION provides two editors for creating and modifying scripts and procedures. Unless you specify a default editor in Preferences, 4th DIMENSION asks you to select an editor when you create a new script, layout procedure, or file procedure.

4th DIMENSION always asks for a type for a new global procedure. See Chapter 6 for more information on creating and editing scripts and procedures.

- **Progress indicator:** Select a progress indicator.

You can tell 4th DIMENSION to display the progress of a process (such as sorting or indexing) through a number display or a graphic thermometer. The thermometer is slower, but easier to read. The numbers are faster, but they don't always refer to records processed. For example, when 4th DIMENSION performs a sort, the numbers also show the number of comparisons made.

- **Desktop:** Instruct 4th DIMENSION to remember the desktop.

Unless you specify otherwise, when you open a database, 4th DIMENSION automatically opens any windows that were open the last time you quit the database, and displays them in the same location in which they appeared previously. If you deselect the Remember check box, 4th DIMENSION opens only one window, displayed in its standard location.

- **Edit Styles:** A style is a display format or an entry filter that you name. After you create a style, you can use the style name instead of having to create the format or filter. Styles are convenient for formats and filters that you use often.

If you click the Styles button, 4th DIMENSION displays the Styles dialog box. For more information on creating styles, see "Using Styles" in Chapter 4.



DESIGNING A DATABASE STRUCTURE

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DESIGNING A DATABASE STRUCTURE

This chapter tells you how to use 4th DIMENSION's Structure editor to create and modify database structures. A database structure consists of files and fields used to store information, and the relationships between the files and fields.

This chapter tells you how to

- manipulate file images in the Structure window
- create files
- create subfiles
- relate files
- create fields
- set field types
- set field attributes
- modify fields

Databases and Database Structures

The structure of a database consists of files and the relationships between those files. The structure of a database is like the foundation of a house—it provides the basis for everything else. This section gives a general description of databases, and of how to design database structures to meet different information storage needs.

Database Basics

A database is any collection of information, organized so that it can be used efficiently. A telephone book is a good example of a database. So is a dictionary, a calendar, or a cookbook.

The information in a database is organized in the form of records. Each record contains all of the information about one person or thing in the database. For example, each record in the telephone book contains one person's address and telephone number.

Each record is organized by fields. A field contains a particular type of information. For example, in the telephone book database, one field contains the person's name; a second field contains the person's address; and a third field contains the person's telephone number. Every record contains each of these fields, and every record can contain information in these categories.

A field name usually identifies the information that goes into the field. A field name is something like Name, Address, Phone Number, and so on. Each field has a field type that identifies the nature of the actual entries. Field types specify the kind of information that can be entered in a field: numbers, dates, alphanumeric characters, and others. Limiting a field to a specific type of data makes it possible for a database to perform calculations and other operations on the information in the fields.

The set of records makes up a database file. The information is stored in the fields, arranged in a series of records in the file. Each database can contain several separate files. Figure 2-1 shows how these concepts are related.

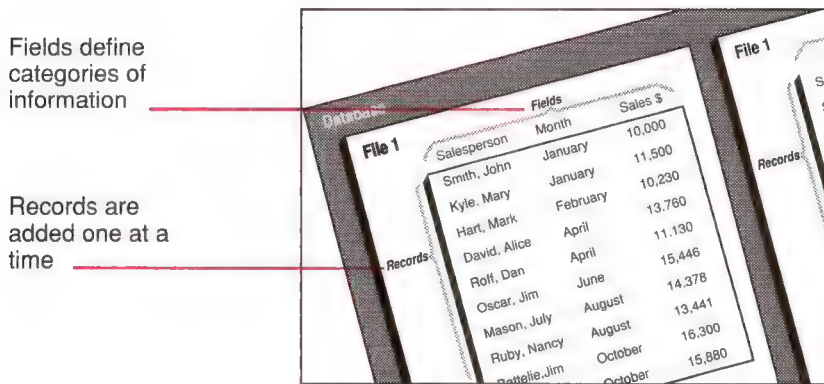


Figure 2-1
Files and fields

4th DIMENSION can reorganize the records and perform various kinds of computation on the information so that the information is useful. For example, 4th DIMENSION can calculate the total of values in a field and present the total in a report. It can sort the records in order by date, or by name. It can calculate a total for each salesperson and display a graph that shows how the sales compare.

Files

Before information can be entered into the fields, to be stored as records in a file, the file and fields must be created. 4th DIMENSION allows you to create one file or many files. This gives you the ability to create a structure that meets your exact needs.

Single-File Structures

Many databases are based on a single file. You use this structure if one file, with as many fields as necessary, is all that is needed for a single category

of things—such as people, companies, or inventory. A file structure with a single file is often called a flat-file database.

File in
Design
environment

People	
First Name	A
Last Name	A
Address	A
Phone	A

Records in
User
environment

First Name	Last Name	Address	Phone
Biff	Davis	689 Elm St.	758-3652
Shirley	Ransome	9087 Ridge Road	252-6892
Lance	Wolfram	333 Main Street	895-6686
Dennis	Hanson	4567 Remington Pl.	456-9256
Lydia	Vernon	978 Ortega St.	682-6983
Andy	Venable	10098 Oregon Rd.	563-3654

Figure 2-2
A single file keeps track of people

In Figure 2-2, every person's record needs the same kinds of data. The database grows in accordance with the number of people stored.

Multiple-File Structures

A database can often store and access data more efficiently by using more than one file. A database that keeps track of both people and companies is a good example. Figure 2-3 shows a multiple-file database in which two files are related.

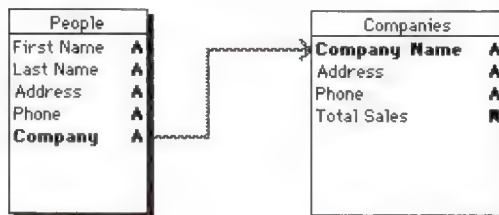


Figure 2-3
Multiple files keep track of people and their companies

In this database, the data for each person is stored in the [People] file. But data about each company is stored in a separate file.

The files are related in ways that allow a user to create a screen display or a printout that automatically obtains information about the correct company for each person.

4th DIMENSION is called a relational database because it can use multiple files and relate them in various ways. For a complete discussion, see "Related Files," later in this chapter.

Sometimes you need a multiple-file structure in which files are not directly related. It may be convenient to have one database to store different kinds of information, such as a contact list and an expense file, as shown in Figure 2-4.

Contacts file image

Contacts	
First Name	A
Last Name	A
Company	A
Title	A
Phone	A

Layout displaying a Contacts record

Contacts	
First Name	Jim
Last Name	Smith
Company	Ajax Parts Co.
Title	Buyer
Phone	895-1285

Expenses file image

Expenses	
Expense Type	A
Date	D
Amount	R
Receipt	B

Layout displaying an Expenses record

Expenses	
Expense Type	Dinner
Date	5/6/89
Amount	\$43
Receipt	<input checked="" type="radio"/> Yes <input type="radio"/> No

Figure 2-4
Unrelated files

4th DIMENSION allows up to 100 files in each database. A file can have up to 511 fields. Using multiple files, virtually any kind of database structure is possible.

Subfiles

Occasionally you will need to store a variable amount of information for each record in a file. 4th DIMENSION allows you to create a file structure that includes a subfile, a file subordinate to a parent file.

For example, suppose you want to keep track of the children of the people in your file. Some people have no children, and some people have many children. You can use a subfile to store this information. Figure 2-5 shows a subfile.

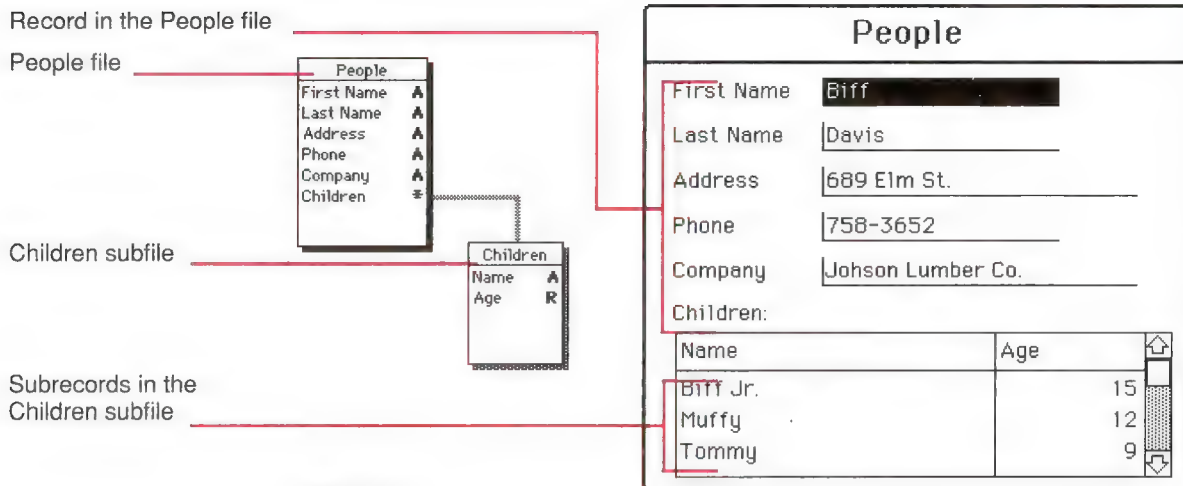


Figure 2-5
A subfile

This subfile allows you to create a varying number of subrecords for each record in the People file. If a person has three children, you can store three subrecords for that record. If a person has no children, you can store zero subrecords.

A subfile is useful for subrecords that you need to see and use only when its parent record is being used. For example, you could easily find the average age of one person's children, but it would be difficult to find the average age of all people's children. If performing this kind of calculation on the data is a requirement for the database, it would be better to use a separate file for Children, not a subfile.

Basic Steps for Creating a Database Structure

Every database has a structure that consists of at least one file and at least one field. These elements must exist before the database can store records.

Typically you create a structure with the following steps:

1. Create a new database.
4th DIMENSION automatically creates the first file.
2. Rename the automatically created file (optional). See "Renaming a File," later in this chapter.
3. Create fields for the file. See "Adding and Modifying Fields," later in this chapter.

4. Add additional files and fields as necessary. See “Creating Files,” later in this chapter.
5. Relate one file to another, if necessary, by drawing a line between fields in the two files. See “Related Files,” later in this chapter.

Using the Structure Editor

The Structure editor, shown in Figure 2-6, lets you manage the database structure—the files and their relationships. It gives you control over files, filenames, fields and field types.

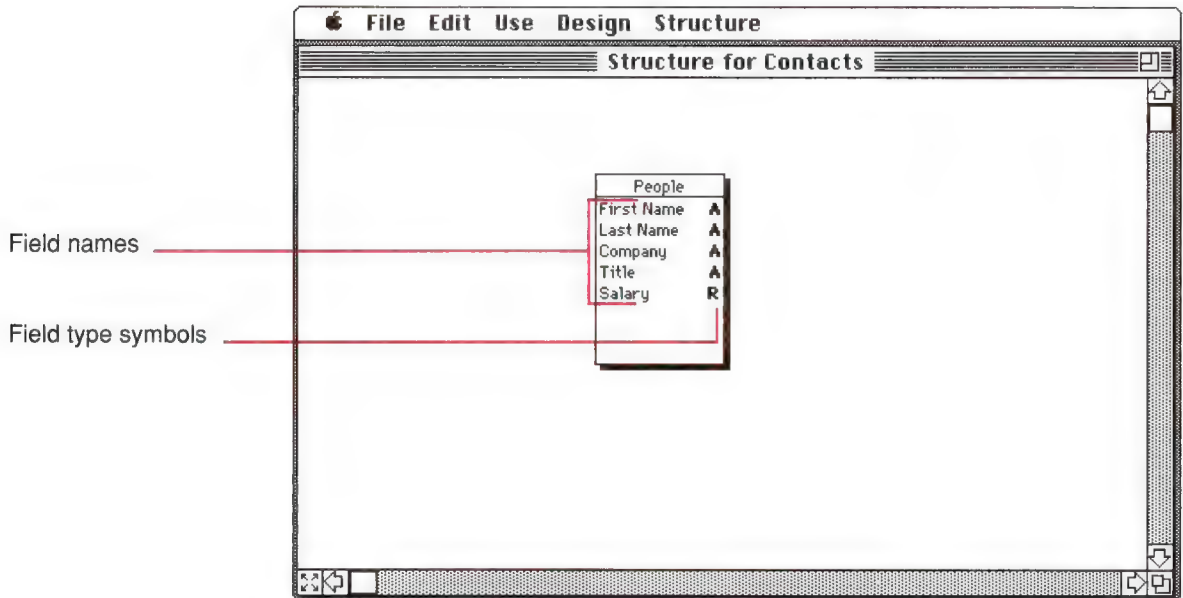


Figure 2-6
Structure editor

The Structure editor gives you a graphic view of a database’s structure and provides menus for performing design operations.

Each file is represented by a file image in the Structure editor. It shows the fields and their types. 4th DIMENSION automatically creates the first file. You can add files as you need to.

Manipulating File Images

To manipulate a file image in the Structure editor window, you first need to select the file image. You can then move or resize the file image.

Selecting a File Image

To select a file, click the file image. 4th DIMENSION highlights the filename and adds a scroll bar to the right side of the file image.

Subsequent actions affect the selected file. Figure 2-7 shows a selected file.

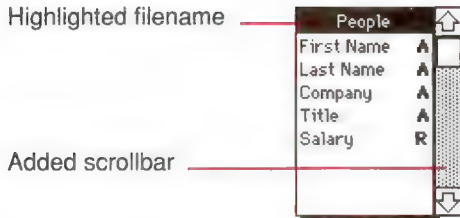


Figure 2-7
Selected file

If the list of fields is longer than the length of the file image, you can use the scroll bar to bring other field names into view.

Moving a File Image

As you add files to your database, you may want to move the file images to get better views of the database's overall organization—this feature is especially useful when a database structure includes lines to subfiles and related files.

To move a file image, drag the filename bar.

Drag the filename bar only. Clicking other parts of the file image may produce different effects—such as creating a new field or changing the size of the file image. Figure 2-8 shows a file image being dragged.

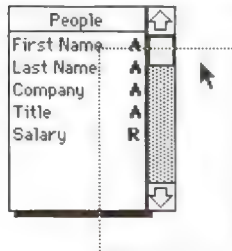



Figure 2-8
Dragging a file image

If the file image that you move is related to another file or subfile, the connecting lines move correspondingly, maintaining their attachment to the other file or subfile.

Resizing a File Image

You can make a file image larger to show more field names, or smaller so that the file image takes up less space in the Structure window. Resizing may hide some of the file's field names from view, but you can use the file image's scroll bar to view any field names that have been hidden.

To resize a file image, follow these steps:

1. Position the pointer over the bottom edge of the file image you want to resize.
 The pointer changes into an up-down arrow.
2. With the up-down arrow, drag the lower edge of the file image up or down to make the image smaller or larger.

Dragging the up-down arrow to the left or right has no effect on the width of the file image—4th DIMENSION automatically maintains a file image width established by the longest field or filename. The maximum is 15 characters, plus a space for the character that identifies field type. Figure 2-9 shows a file image being resized.



Figure 2-9
Resizing a file image

Creating a New File

When you create a new database, 4th DIMENSION automatically creates the first file in the database. If you need additional files, you can create them at any time. You create additional files in order to use a multi-file database.

4th DIMENSION names the first file of a new database "File1".

4th DIMENSION names additional files sequentially, up to File10. You can rename the files at any time. See "Renaming a File," later in this chapter, for more information on naming files.



Important: You cannot delete files. If you create an unwanted file, move it to an unused part of the window and ignore it. You can use the file later if you find you need more files. If you accidentally choose New File, you can cancel the operation by immediately clicking in the menu bar.

To create a new file, follow these steps:



1. Choose New File from the Structure menu.



The pointer becomes a miniature file icon.

If you want to cancel the operation, move the pointer to the menu bar, and click.

2. Move the pointer to the location in the Structure window where you want the upper-left corner of the new file image to be, and click.

4th DIMENSION creates a new file image, which becomes the selected file image in the Structure window.

Repeat steps 1 and 2 for each file you want to add to the database.

Renaming a File

4th DIMENSION automatically names files. You will usually want to rename a file so that the filename identifies its contents or purpose. For example, if [File1] will contain student records, you might rename it [Students].

You can rename files at any time. If you have used the old filename in a procedure or script, 4th DIMENSION automatically changes it to the new name everywhere it occurs (except if the procedure or script is currently open).

Do not use the same name for two files in the same database. If you inadvertently create a duplicate filename, 4th DIMENSION recognizes only the file you created first, ignoring any files subsequently created with the same name.

To rename a file, follow these steps:

1. Select the image of the file you want to rename.

You can rename a file only when its image is selected in the Structure editor.

2. Choose Rename File from the Structure menu.



4th DIMENSION displays the File Attributes dialog box, shown in Figure 2-10 on the following page.



Figure 2-10
The File Attributes dialog box

In addition to the area for the filename, the File Attributes dialog box contains pop-up menus for assigning password access groups for various file operations. For complete information about access rights, see Chapter 8, “Managing Password Access.”

3. Type a new filename.

You can enter up to 15 characters in the Name area. The filename must begin with a letter. You can use any letters or numbers, the space, and the underscore. 4th DIMENSION truncates filenames longer than 15 characters and removes spaces at the beginning or end of the name.

4. Click OK.

The new filename appears in the selected file image.

Creating and Modifying Fields

After you create your database files, you need to create the fields that hold the data you want to store and manage.

When you create fields, you must assign each field a field type that describes the kind of information that will be stored in the field. 4th DIMENSION uses this field type to perform different kinds of operations on the contents of that field. For example, if a field will contain a date, you will want to identify it as a Date field so that 4th DIMENSION can compute date values, such as length of service or qualification for benefits. Field types are described in detail later in this chapter.

In addition to the field type, each field in a database file can possess any of six attributes. Attributes describe conditions for entering, displaying, or modifying data in the fields. They are described in detail later in this chapter.

After you create a field, you can return to it to change the field type or any of its attributes (except for a subfile).

Creating New Fields

Each time you add a new field to a file, you perform these steps:

- Name the field.
- Specify a field type.
- Select field attributes (optional).

You can add up to 511 fields to a database file or subfile. 4th DIMENSION adds fields to the file image in the order that you create them. You cannot reorder field names. You can, however, order the fields any way you want in the input and output layouts you will use to enter and manage the data. See Chapter 3 for information about layouts.

Do not use the same name for two fields in the same file. If you inadvertently create a duplicate field, 4th DIMENSION recognizes only the field you created first, ignoring the subsequently created field. Do not leave a field name blank.



Important: You cannot delete fields. If you create an unwanted field, leave it at the end of the field list and name it Unused. You can use the field later if you find you need more fields.

To create a field, follow these steps:

1. Select the file image in the Structure editor.
You create fields within files. Before you can create a field, you must select the file you want it to belong to.
2. Choose New Field from the Structure menu. Or double-click on the blank part of the file image below the field names (if any). See Figure 2-11 on the following page.



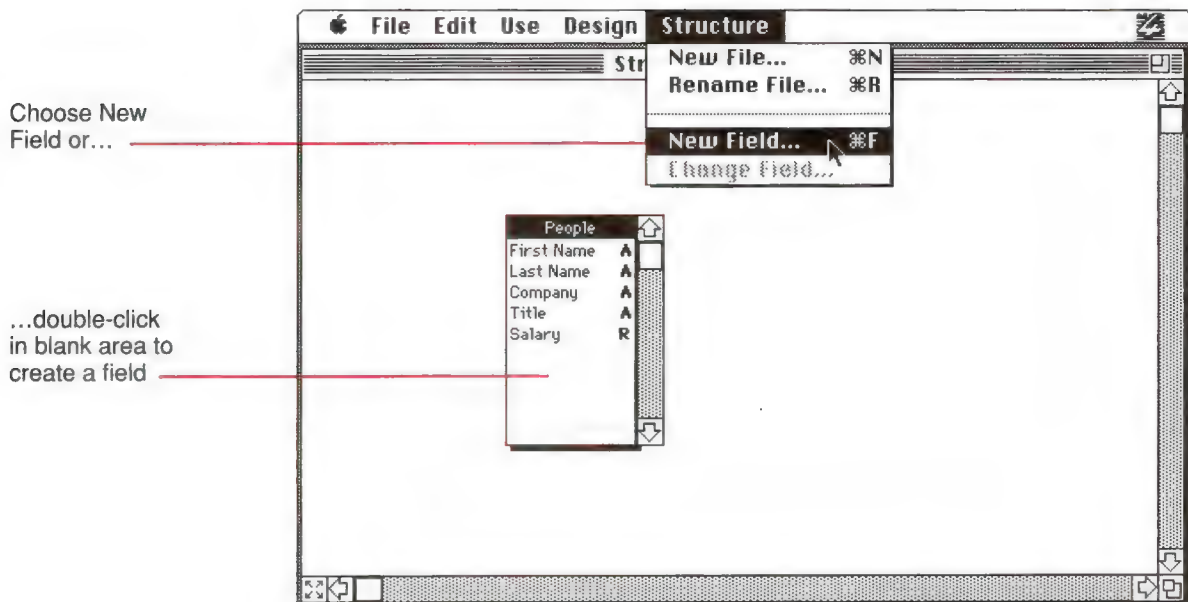


Figure 2-11
Creating a new field

4th DIMENSION displays the Field for *Filename* dialog box in which you specify the field description. This dialog box always identifies the file to which the field belongs. Since the filename changes in practice, throughout this book this dialog box is called simply the Field dialog box. Figure 2-12 shows the dialog box.

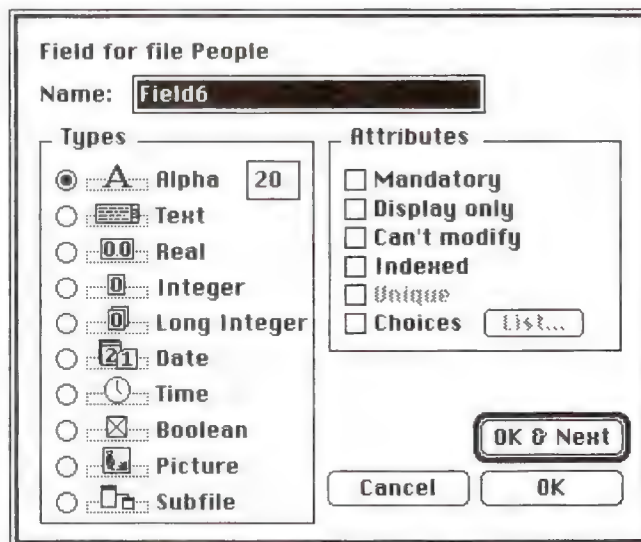


Figure 2-12
Field dialog box

3. Type the field name in the Name area.

You can enter up to 15 characters in the Name area. The field name must begin with a letter. You can use any letters or numbers, the space, and the underscore. 4th DIMENSION truncates field names longer than 15 characters and removes spaces at the beginning or end of the name.

4. Select a field type.

For information, see “Field Types,” later in this chapter.

5. Select any attributes.

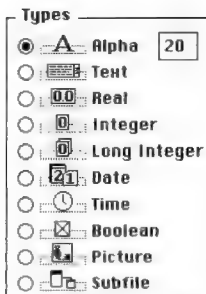
For information, see “Field Attributes,” later in this chapter.

6. Click OK to save the field description and close the dialog box. Or click OK & Next to save the field description and display the Field dialog box for another new field.

If you decide not to create the field, click Cancel.

Repeat steps 3 through 6 to create additional fields for the file.

Field Types



You must specify a field type for each field. Field types affect how 4th DIMENSION manipulates and stores the data in a field, and how you enter or display data in layouts.

Fields can have display formats that affect the way they are displayed. They can also have data entry filters that control data entry into the field. Both display formats and data entry filters are established in individual layouts. For information on display formats and entry filters, see Chapter 4, “Designing the Interface.”

You set the field type in the Field dialog box. There are ten field types.



Alpha

An Alpha field contains alphanumeric characters (letters and numbers), punctuation marks, and special characters such as the asterisk (*), percent sign (%), hyphen (-), and so on. You would use an Alpha field to contain any information that must be treated as text, and that has a known length.

Alpha is the most common field type. Typically, you use this field type for names, addresses, telephone numbers, United States Zip codes, and so forth. Zip codes are best placed in an Alpha field for two reasons: Number fields do not display leading zeros, and some Zip codes contain a hyphen. The general rule for deciding between a Number field or an Alpha field is make it an Alpha field unless it will be used in a numerical calculation or searched or sorted based on numeric values.

You can set the maximum length of an Alpha field to be between 2 and 80 characters long. During data entry, an Alpha field accepts any character, number, punctuation mark, or special character.

An Alpha field can be indexed (whereas a Text field cannot be indexed).

Alpha fields support string manipulations, such as concatenation or extraction of substrings.



Text

A Text field can hold up to 32,767 alphanumeric characters. You would use a Text field to hold blocks of text longer than 80 characters, such as comments or descriptions.

During data entry, Text fields provide basic text editing features: scrolling; word wrap within the area set for the field display; double-clicking to select a word; arrow key control over the insertion point; and standard cut, copy, and paste operations. A Text field accepts a carriage return during data entry to create a new paragraph.

In an input layout, a Text field can be given a vertical scroll bar. In a printed report, the Text field area can expand as necessary to print all the information, even if it covers several pages.

You can paste text into Text fields, including text from word processors.

You cannot index a Text field, but you can perform a search based on characters in the field.



Real

Use a Real field type for any field that must hold decimal numbers (Price, Salary, Expenses, and so on). Real number fields can hold any number in the range of $\pm 1E1022$. Calculations on values in Real fields retain accuracy to 19 digits.



Integer

Use an Integer field type for any field that stores numbers without decimals (Record Number, Invoice Number, and so on). Integer fields are 16-bit. They can contain whole numbers between $-32,767$ and $+32,767$. Calculations on Integer fields are accurate to 4 digits.



Long Integer

Use a Long Integer field type for any field that stores numbers without decimals that are too large for an Integer field. Long Integer fields are 32-bit. They can contain whole numbers between -2,147,483,647 and +2,147,483,647. Calculations on Long Integer fields are accurate to 9 digits.



Date

A Date field can store any date value (month, day, year) entered in a *MM/DD/YYYY* format between the year 100 and the year 32,767.



Time

A Time field can store any time value entered in *HH:MM:SS* format. Use this field type to manage times such as current time, meeting time, billed time, and so on.



Boolean

Boolean, or logical, fields contain TRUE or FALSE values. A Boolean entry can be one of only two choices: Yes/No, True/False, 1/0, Male/Female, and so on.

You can format a Boolean field as either a check box or as a pair of radio buttons. A check box that contains a check is TRUE; empty, it is FALSE. Either the first radio button is selected (TRUE), or the second button is selected (FALSE).



Tip: You should name a Boolean field so that you can ask the question, "Is *fieldname* true?" This question is useful for searching because during a search, 4th DIMENSION looks for TRUE and FALSE in a Boolean field. For example, name a field Male instead of Sex. Your search condition can then be written "Male is equal to true," instead of "Sex is equal to true."



Picture

A Picture field stores graphics created in a Macintosh graphics application such as MacPaint or MacDraw II. A Picture field can store pictures of unlimited size, subject to the amount of memory available to display the picture. Use Picture fields to store digitized photographs, diagrams, maps, and illustrations.

A Picture field can store bitmapped graphics or object graphics in the PICT or PICT2 formats. Some Macintosh applications store extra information with pictures. This information "tags along" when the picture is copied and pasted into a picture field. This information may provide special instructions when used by an output device such as a PostScript printer. 4th DIMENSION uses this extra information when printing the picture to an appropriate device.



Subfile

A Subfile field is actually a complete file associated with an individual record in a file. A single subfile can contain up to 32,767 subrecords, and each subrecord can have as many as 511 subfields.

The record to which a subfile is attached is called the parent record; the file that contains the parent record is called the parent file. Each subfile has its own set of fields, called subfields.

Records in subfiles can also contain subfile fields. This means that you can nest subfiles. 4th DIMENSION allows up to five levels of subfiles, but such a structure is not recommended. Because 4th DIMENSION loads subfiles into memory when it loads their parent records, the number of subfiles and subrecords is limited by the amount of available memory. A good maximum for subfiles is 100 subrecords per parent record.

Use subfiles to manage a variable number of records that may be associated with records in the parent file. For example, you may want to create a student file in which each record contains data about the student's honors and the dates of the awards. Instead of having to create a number of fields such as Honor 1, Honor 2, and so on, to store the data, you can create a subfile to which you can add records as the awards accumulate.

You add subfields to a subfile in exactly the same way that you add fields to files.



Important: After you define a field as a Subfile field, you cannot assign it another field type.

Field Attributes

Attributes

☐ Mandatory
☐ Display only
☐ Can't modify
☐ Indexed
☐ Unique
☐ Choices

Field attributes are optional additions to a field's instructions. Each field in a database file can possess several attributes.

You set the field attributes in the Field dialog box. Attributes that cannot be selected for a particular field type are disabled and dimmed. A description of each of the field attributes follows.

Mandatory

When the Mandatory attribute is set for a field, the user must enter a value in that field during data entry. 4th DIMENSION does not accept a record that contains an empty mandatory field. You would set the Mandatory attribute for a field that contains essential information for your database. The field that uniquely identifies each record is a good candidate for the Mandatory attribute. Social security numbers, invoice numbers, certain dates, or employee numbers might need to have the Mandatory attribute set, to protect the integrity of the records.

You can also set the Mandatory attribute for any field in a particular layout. For information, see Chapter 4.

Display only

The user cannot enter values from the keyboard into a field that has the “Display only” attribute set. You must use a default value for such a field, or write a script or procedure that inserts a value in the field. A field with the “Display only” attribute is useful for displaying values that you don’t want database users to modify, such as calculated totals.

You can also make any field nonenterable on a particular layout. For information, see Chapter 4.

Can’t modify

If the “Can’t modify” attribute is set for a field, 4th DIMENSION accepts the value initially entered in the field, but does not allow the user to modify the value after the user saves the record. The user can edit an entry in such a field only during the initial creation of the record, before it is accepted. Once the user saves the record, the value in the field is unchangeable, except by a script or procedure.

Use “Can’t modify” for fields that must provide an audit trail, such as Date Received, Date Paid, and so on.

Indexed

The Indexed attribute causes 4th DIMENSION to create an index table for the field. The table allows 4th DIMENSION to perform rapid searches and sorts on a field. When searching or sorting on a nonindexed field, 4th DIMENSION moves through data sequentially, examining each record in order. An index allows 4th DIMENSION to search and sort without going through every record.

You can index Alpha, Real, Integer, Long Integer, Time, Boolean, and Date fields. As you add and delete records, 4th DIMENSION automatically updates its index table. If you assign the Indexed attribute to an existing field, 4th DIMENSION automatically indexes the existing data when you leave the Design environment. You can specify as many indexed fields as you want. The Structure editor displays indexed fields in boldface.

An index increases the size of the database, taking storage space. Using many indexes may also increase the time needed to save a record, since 4th DIMENSION updates the index table with each entry.

Unique

Setting the Unique attribute ensures that a field contains a unique value in each record. This prevents duplicate values. This attribute is useful as a validation for fields that store employee numbers, Social security numbers, purchase order numbers, and so on. If you want to set the Unique attribute for a field, you must first make it an indexed field.

Unique prevents duplication of empty values as well as positive entries. An empty field cannot be duplicated in another record.

If you apply the Unique attribute to a Subfile field, although you generally would not, the attribute ensures that no subrecord contains a duplicate value. The Unique attribute applies to all subrecords for all parent records; no subrecord for any parent record can contain a duplicate value.

Choices

Use this attribute if you want to display a list of choices for entry in the field. To use this attribute you need to create a list of choices with the Lists editor. For information, see Chapter 9.

Use the Choices attribute whenever you want to standardize entries in the field and avoid misspellings. Use a choices list for a field that has a limited number of valid entries, or a limited number of usual entries. Displaying a list of choices does not prevent a user from typing another value.

You can also supply a list of choices for any field in a particular layout. In a layout, you can also prevent a user from typing in a different value by making the list required. For information, see Chapter 4.

Modifying Fields

You can change a field's name, attributes, or type at any time, whether or not you have entered data into the field.

If you change the field name, 4th DIMENSION automatically updates the name anywhere the field is used in procedures, layouts, and in User environment definitions such as saved search conditions and Quick Report designs.

Do not use the same name for two different fields in the same file. If you inadvertently create a duplicate field, 4th DIMENSION recognizes only the field you created first, ignoring the fields created later with the same name.

If you change field attributes, the change usually does not affect data already entered into the field. For example, if you set the Unique attribute, only entries made after that are checked for uniqueness; field entries made up to that point may include duplicates. However, if you set the Indexed attribute, all field values (both old and new) are included in the index.

If you change the field type before entering any data into the field, 4th DIMENSION simply changes the field type. The only restriction is upon the Subfile field type, which cannot be changed to any other field type.

If you change the field type after entering data into the field, 4th DIMENSION converts the data if possible. Data from a Picture field converted to any other type does not display. Data from a field converted to a Picture or Subfile field type does not display.

When you convert a field type, 4th DIMENSION retains the field's original value until you modify the record. For example, if a Text field contains text such as "over 10" and you change the field type to Integer, the modified field displays "10". But if you change the field back to a Text field without editing the field value, 4th DIMENSION displays "over 10" again.

To modify a field, follow these steps:

1. In the Structure editor, select the field you want to modify, and then choose Change Field from the Structure menu. Or double-click the field name.
4th DIMENSION displays the Field dialog box for that field. The dialog box displays the field name, type, and attributes that you have previously assigned to the field.
2. Make any changes you want to make.
3. Click OK to save the field description and close the dialog box.



Related Files *L 215*

Related files allow data stored in one file to be accessed from another file. With related files, you can store data efficiently, update data in one place and have the change reflected everywhere that the data is used, and do searches and sorts in one file that are based on data in another file.

For example, suppose you create a database for people and their companies. You can use two related files to gain access to the information: One file stores information about the people, and another file stores the company information. Figure 2-13 on top of the following page shows two related files.

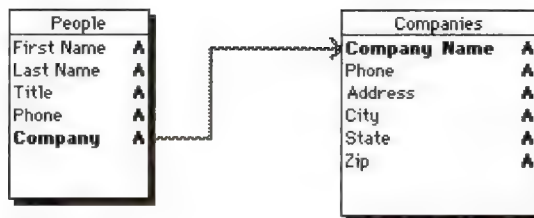


Figure 2-13
Related files structure

The [People] file contains one record per person. The [Companies] file contains one record per company. For each person you can view the corresponding company information—the address, city, state, Zip code, and company telephone number. For each company, you can view all the personal information—the name, title, and personal telephone number—for each person in the company.

Related Fields

The basic purpose for relating files is to instruct 4th DIMENSION which record or records to make current in one file based on which record is current in the other file. The related files make use of data in two related fields to identify corresponding records.

In this example, the Company field in the [People] file and the Company Name field in the [Companies] file relate the two files. When you enter a company name in a person's record, 4th DIMENSION can automatically display the company address in that person's record. If you view a company's record, 4th DIMENSION can automatically list all the people who work at that company in that company's record. The field that stores the company name in each file is the field that relates the two files.

Figure 2-14 shows how one company name identifies several records in the [People] file, and one record in the [Companies] file.

Related fields

First Name	Last Name	Title	Company	Company Name	City	St	Phone
Biff	Davis	Salesperson	Howard Battery Co.	Howard Battery Co.	Arcadia	CA	818-576-2534
Andy	Venable	Engineer	Howard Battery Co.				
Bryan	Pfaff	Secretary	Howard Battery Co.				
Kathy	Forbes	Secretary	Howard Battery Co.				

Figure 2-14
Data in related fields

4th DIMENSION requires that, in one of the related files, the field that relates the files contain only unique values, not duplicated in any record. In this example, it is the [Companies] file. The Company Name field cannot contain any duplicate company names. In the other file, the Company field can contain duplicated values. Since you have records for several people who work at the same company, the Company field often contains the same company name.

The One File and the Many File

Two related files are always called the One file and the Many file, depending on how many records can be specified by the relation. In this example, the [Companies] file is the One file and the [People] file is the Many file. This section explains the One file and the Many file in detail.

When any record in the [People] file is made current, 4th DIMENSION loads the corresponding single record from the [Companies] file and displays the address. Because the relation is specifying exactly one record in the other file, only one company address is displayed. Figure 2-15 shows how a company name in a record in the [People] file specifies one record in the [Companies] file, so that the [People] file record can display the company's address.

People	
First Name	Biff
Last Name	Davis
Title	Salesperson
Company	Howard Battery Co.
Address	243 Second Ave.
City	Arcadia
State	CA
Phone	818-576-2534

Company name specifies one company in [Companies] file

Data from [Companies] file

Figure 2-15
Company name specifies one company

Conversely, when any record in the [Companies] file is made current, 4th DIMENSION loads and displays the many corresponding records from the [People] file. Because the relation is specifying several records in the other file, the names and titles of many people are displayed. Figure 2-16 shows how a company name in a record in the [Companies] file specifies several records in the [People] file, so that the [Companies] file record can display a list of people employed at that company.

Many people are "related" to one company

Companies			
Company Name	Howard Battery Co.		
Address	243 Second Ave.		
City	Arcadia	State	CA
First Name	Last Name	Title	
Biff	Davis	Salesperson	
Andy	Venable	Engineer	
Bryan	Pfaff	Secretary	
Kathy	Forbes	Secretary	

Figure 2-16
Company name specifies many people

The distinction between the One file and the Many file is specific to a particular relation. A file may be the One file in one relation, and the Many file in another.

For example, suppose you decide to send a package of sample merchandise to everyone in your [People] file. You add a [Postal Rates] file that contains Zip codes and the postal rate for each Zip code. Using this structure enables you to print an address label for each person that includes the amount of postage needed to mail the package. Figure 2-17 shows the [Postal Rates] file added to the database structure.

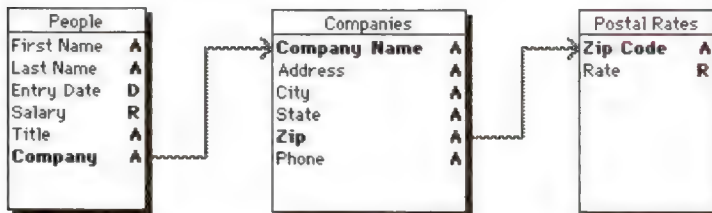


Figure 2-17
Another file added to the structure

Each Zip code in the [Postal Rates] file is unique, so the [Postal Rates] file is the One file. The Zip field in the [Companies] file can contain duplicate Zip codes, for companies that are near each other. The [Companies] file is therefore the Many file in relation to the [Postal Rates] file.

Whether a file is a One file or a Many file, therefore, depends on its relation with the other file. The [Companies] file is the Many file in relation to the [Postal Rates] file, and it is the One file in relation to the [People] file.

The Relating Field and the Related Field

Whenever you use information from related files, you start from one of the files. If you are in the Many file, you can relate to one record, making use of the information from the single record the relation specifies. If you are in the One file, you can relate to many records, making use of the information from the many records the relation specifies.

You will occasionally need to differentiate the *relating* field (where you start) from the *related* field (where you end). Unlike the difference between the One file and the Many file, the difference between the relating field and the related field depends only on where you start. The relating field is the field that connects to the other file; the related field is the field that is connected in the other file.

For example, when you are using a layout for the [People] file, the Company field is the relating field, and the Company Name field in the [Companies] file is the related field. Conversely, when you are using a layout for the [Companies] file, the Company Name field is the relating field, and the Company field in the [People] file is the related field.

Automatic and Manual Relations

The relation that specifies one record in the One file and many records in the Many file is either automatic or manual.

In an automatic relation, whenever a record in a related file is made current, 4th DIMENSION selects the corresponding record or records and loads them into memory. The record or records so specified can then be viewed, printed, modified, or used in searches and sorts. No programming is required.

In a manual relation, you can exercise control over whether 4th DIMENSION loads the corresponding record or records into memory. To exercise this control, you need to do some programming. For complete information about creating the procedures that control related files, see the *4th DIMENSION Language Reference*. **L215**

You will usually choose to relate files automatically. You would use a manual relation if you wanted to optimize the performance of specific applications that do not need all corresponding records loaded each time. You would also use a manual relation if you wanted to relate two files with two separate relations. Only one automatic relation can exist between two files. Any number of manual relations can exist between two files.

Entering Data in Related Files

You can display fields from one file in a layout for a related file. The user can use these fields to enter and edit data directly in the records of the related file.

If the relation is automatic, you can display fields simply by selecting them. Information entered into the displayed fields is automatically saved in the field's file. For complete information, see "Selecting Fields for the Layout," in Chapter 3.

If the relation is manual, procedures must exist to display the fields and to save the information entered. 4th DIMENSION automatically generates certain minimal procedures when layouts are created, so that the information can be displayed in the related file's layout, but you must create procedures to transfer and save any entered data.

For complete details about entering data into fields from related files, see the *4th DIMENSION User Reference*.

Using Wildcard Look-ups

When files are related, 4th DIMENSION allows the user to look up values in the One file when entering data into the relating field in the Many file. The user simply uses the standard wildcard character (@) in the relating field. Doing so causes 4th DIMENSION to look up the corresponding entry in the related field.

The wildcard character can be used in two ways: to complete a partial entry or to display a list of valid entries. When a list is displayed, the user can select the entry from the list. An additional field can be displayed with the related field.

For example, suppose the user is creating a record in the People file. Instead of typing **Apple Computer, Inc.** in the Company field, the user can type **Ap@**, and then press Tab to move to the next field. Because @ is the 4th DIMENSION wildcard character, this entry means "this value starts with **Ap** and is followed by anything else." 4th DIMENSION looks in the related field for the entry. If it finds one, it completes the entry and selects the next field in the data entry order. Figure 2-18 shows how this use of the wildcard works.

People

First Name | Alan |

Last Name | Hull |

Company | Ap@ |

Salary | 0 |

People

First Name | Alan |

Last Name | Hull |

Company | Apple Computer, Inc. |

Salary | 0 |

Figure 2-18
Completing an entry with a wildcard

If 4th DIMENSION finds more than one entry that meets the requirement, it displays a list of entries so that the user can select the correct one. Figure 2-19 shows such a list being displayed.

L219

Entry for People

Enter

1/41

Delete

Cancel

People

First Name | Alan |

Last Name | Hull |

Company | ap@ |

Salary | |

Selection

Appalachian Steel	Chicago
Apple Computer, Inc.	Cupertino
Application Systems	Sunnyvale

Figure 2-19
List displayed to select the entry

You can specify a second field for the list, to help the user decide which company to select. Figure 2-19 shows the list of companies displaying the city as well as the company name.

The additional field assists the user who doesn't know whether the company is named Appalachian Steel or Appleton Steel, but remembers that the company is located in Chicago.

To see a list of all companies in the [Companies] file, the user enters @ only. 4th DIMENSION then displays a list of all the companies so that the user can select the correct one. Figure 2-20 shows a complete list of companies being displayed.

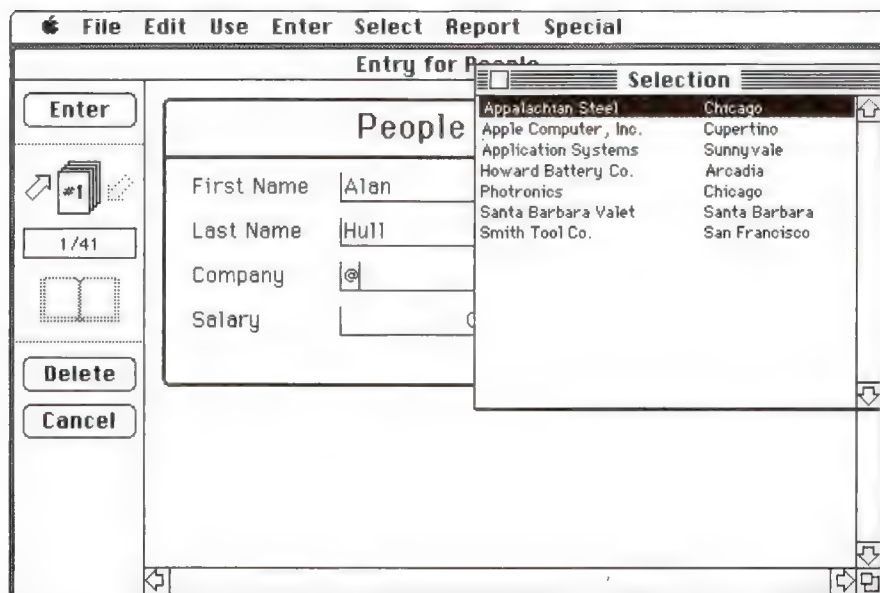


Figure 2-20
Complete list of all the companies

If the relation is automatic, the wildcard look-up feature exists automatically. You can choose an additional field to display with the related field when you create the relation. Figure 2-21 shows the additional field being selected.

Additional field to
be displayed in
look-up list

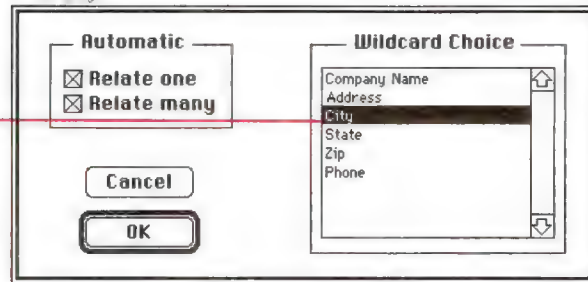


Figure 2-21
Choosing the additional field

If the relation is manual, procedures must exist to provide the look-up feature. The procedure can specify the additional field. For information, see “Managing File Relations” in the *4th DIMENSION Language Reference*.

Creating a New Record in the One File

The user enters records in the One file as in any other file—by typing information into an input layout, or by importing the data. Occasionally, the user will need to create a new record for the One file while creating a record in the Many file.

For example, suppose that, while creating a record in the [People] file, the user enters a company name that doesn't exist in the [Companies] file. If 4th DIMENSION requires a match in the related file, 4th DIMENSION will automatically give the user the opportunity to create a new record in the [Companies] file. Figure 2-22 shows the message displayed when a user enters a new company name.



Figure 2-22
Entering a new value in the relating field

4th Dim Ver 2.1
Upgrade Addendum
1 item
3 page 3 "Relation Type
Dialog Box"
11 4 page 5 "Deletion Control"

If the relation is automatic, 4th DIMENSION requires that the corresponding record exist in the related file. The chance to create a new record in the One file is provided to the user automatically.

If the relation is manual, 4th DIMENSION requires the corresponding record to exist only if the field in the Many file has the Mandatory attribute set. If the relating field does have the Mandatory attribute set, 4th DIMENSION provides the user with the chance to create a new record in the One file. If the relating field does not have the Mandatory attribute set, 4th DIMENSION ignores the failure to specify a record in the related file.

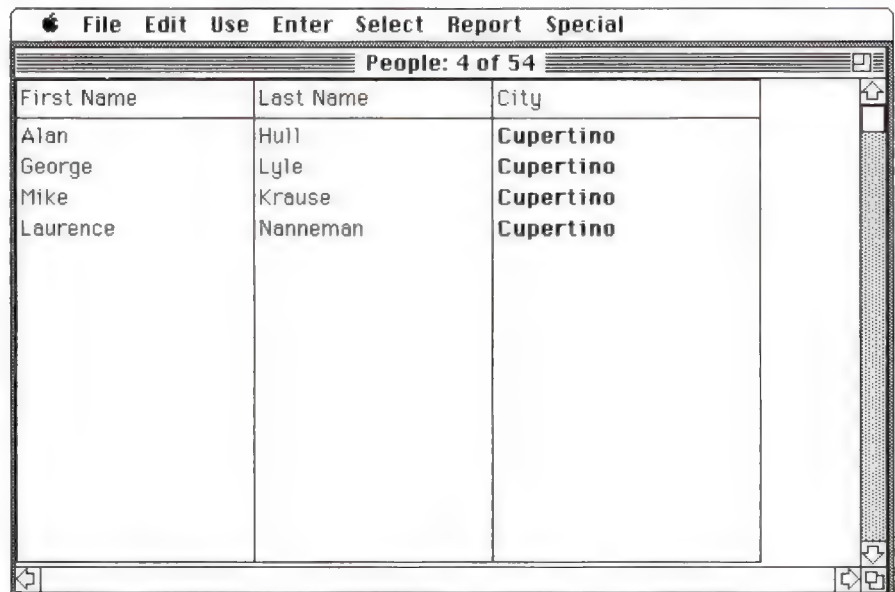
Searching and Sorting Records

When files are related, the user can perform searches and sorts that use information from one file to manipulate records in the related file. Searches that create a selection are used for graphs, reports, and labels in the User environment. Sorting is used for reports and labels.

For example, the user can display a list of people whose companies are located in San Francisco by searching in the [People] file with the following search condition:

“[Companies]City is equal to Cupertino”

4th DIMENSION creates a selection in the [People] file based on information in the [Companies] file. Figure 2-23 shows the results of this search.



The screenshot shows a window titled "File Edit Use Enter Select Report Special". Below the menu bar is a status bar that says "People: 4 of 54". The main area contains a table with three columns: "First Name", "Last Name", and "City". The table lists four people, all of whom are located in Cupertino.

First Name	Last Name	City
Alan	Hull	Cupertino
George	Lyle	Cupertino
Mike	Krause	Cupertino
Laurence	Nanneman	Cupertino

Figure 2-23
Selection based on value in the related file

Conversely, the user can search for companies that employ people named Johnson. If the user is in the [Companies] file when the search is performed, the selection is based on information in the related file (in this case, the [People] file).

You can also do a sort based on information in the One file. The user must perform the sort from the Many file. For example, the user can display a list of people sorted by the city and state stored in the [Companies] file.

If the relation is automatic, these capabilities are automatic.

If the relation is manual, searches and sorts must be created by procedures.

Maintaining Relational Integrity

4th DIMENSION protects the integrity of related files by inactivating relations that would distort the selection of records in any related file. The material in this section will be of interest only to experienced database designers. In general, 4th DIMENSION handles related files as you would reasonably expect.

4th DIMENSION automatically detects relational situations that would cause data to be inaccurate and prevents them. This is done by not establishing the relation that would corrupt the integrity of the data. Using the People and Companies files example, suppose you are entering a record for a person, and you need to view the record for the person's company. Normally, displaying the company record would load all the people who work for this company. In this situation, doing so could cause the person's record to become just one of several records in the selection in the People file. In this case, 4th DIMENSION simply does not load the related people while in the company file.

4th DIMENSION allows you to relate files in sequence, as you have seen in the example database. This means, for example, that if you select a record in the [People] file, a corresponding record in the [Companies] file is loaded, and another corresponding record in the [Postal Rates] file is also loaded. Figure 2-24 shows the Structure window with files related in a series.

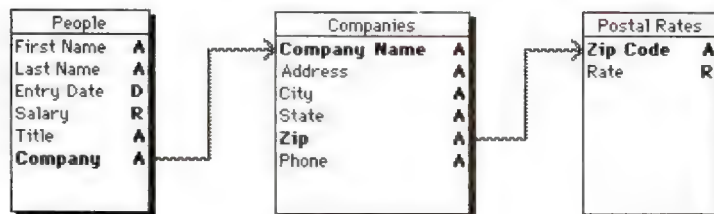


Figure 2-24
Files related in a series

If the relation is automatic, the continuous loading of corresponding records always moves from the Many file to the One file. When a record from the Many file is loaded, 4th DIMENSION loads the corresponding record from the One file. If that file is a Many file in relation to another file, 4th DIMENSION loads the corresponding record from that One file. This process continues until the last One file is reached. It is conceivable that you could create a file structure that loops back upon itself, each file related to the next in a circle.

4th DIMENSION stops loading records at the last relation. In other words, 4th DIMENSION does not get trapped in an endless loop of loading corresponding records.

From the One file to the Many file, 4th DIMENSION performs only one loading of corresponding records. For example, if a record in the [Postal Rates] file is made current, 4th DIMENSION loads all the records that have the corresponding Zip code in the [Companies] file. But the loading stops there; no records from the [People] file are loaded.

If the relation is manual, procedures control which records are loaded. You can control which files load records in either direction, from Many to One, and from One to Many.

Creating a Relation Between Files

You must have at least two files in your database to create a relation.

You create a relation by drawing a line between two fields. The field where you start drawing must be in the Many file (in the previous examples, the People file). The field where you end the line must be in the One file (in the previous examples, the Companies file).

The related fields must have the same field type. You can use these field types for the related fields:

- Alpha
- Number (Real, Integer, Long Integer)
- Date
- Time
- Boolean

The One file must have unique entries in the related field.

If the user inadvertently enters a duplicate entry in the related field in the One file, 4th DIMENSION always loads the first record and ignores the remaining records.

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For the relation to work automatically, the related fields must be indexed. If the fields do not have the Indexed attribute set, 4th DIMENSION automatically indexes them when you change environments.

You can create a relation between files at any time. If the related fields are indexed, the relation is established immediately. If the related fields are not indexed, the indexes are built when you change to another environment.

D75, D180

For information about including fields from related files in layouts, see Chapters 3 and 4. For information about entering information into related files, see the *4th DIMENSION User Reference*. 442

To create a relation between files, follow these steps:

1. In the Structure window, in the Many file move the pointer over the name of the field that you want to use to relate the files.
2. Hold down the mouse button and drag toward the file to be related.

As you move the pointer, 4th DIMENSION selects the field and draws a thin line, as shown in Figure 2-25.

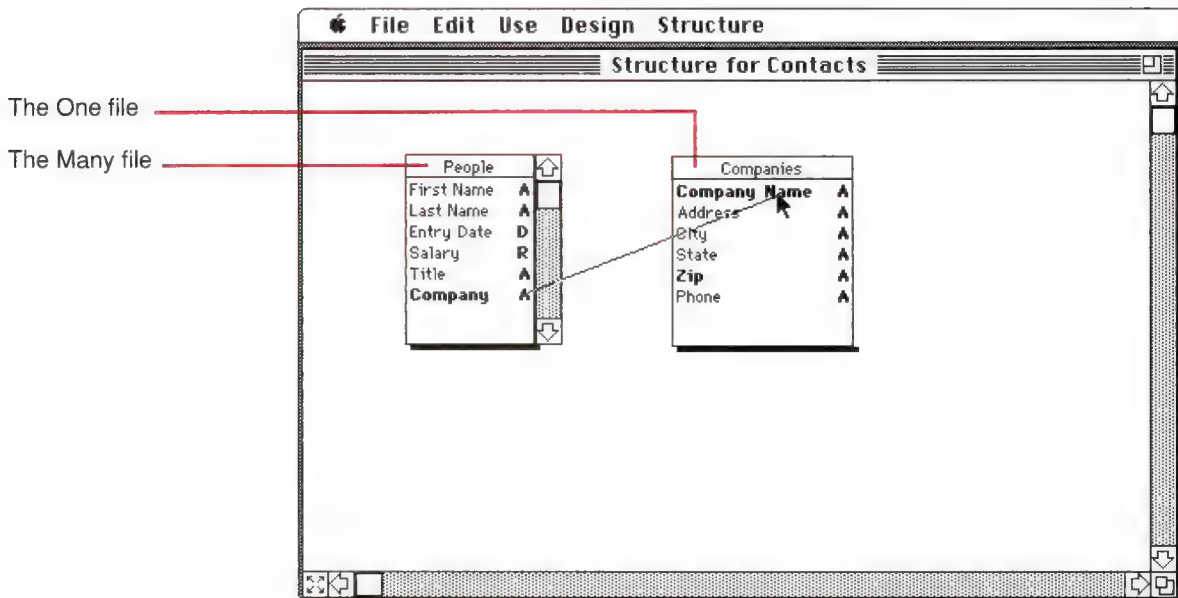


Figure 2-25
Drawing the line to create a relation

3. Move the pointer over the key field in the One file, and release the mouse button.

The Relation dialog box appears, as shown in Figure 2-26.

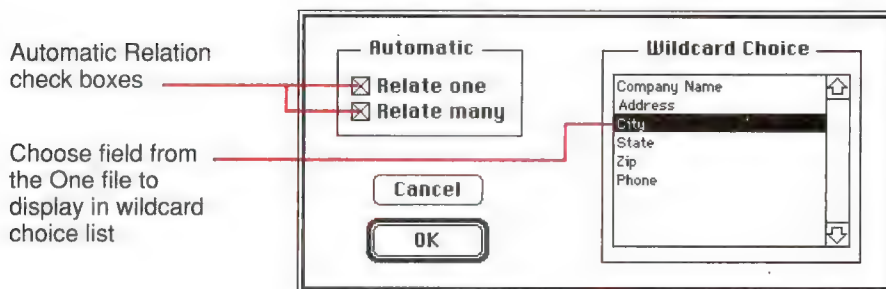


Figure 2-26
The Relation dialog box

The automatic relations are preselected.

Relate to One causes 4th DIMENSION to load the corresponding record in the One file when a record in the Many file is made current.

Relate to Many causes 4th DIMENSION to load all corresponding records in the Many file when a record in the One file is made current.

You would deselect one or both only if you wanted to prevent one or the other automatic relation from taking place, or if you wanted to control the relation with procedures.

4. From the list on the right, select the additional field to display in a wildcard lookup choice list from the list.

If you want only the related field to display in the look-up choice list, select it in this dialog box.

5. Click OK.

4th DIMENSION displays the Structure window and draws a line between the two fields, as shown in Figure 2-27. In a color display, the line appears in color.

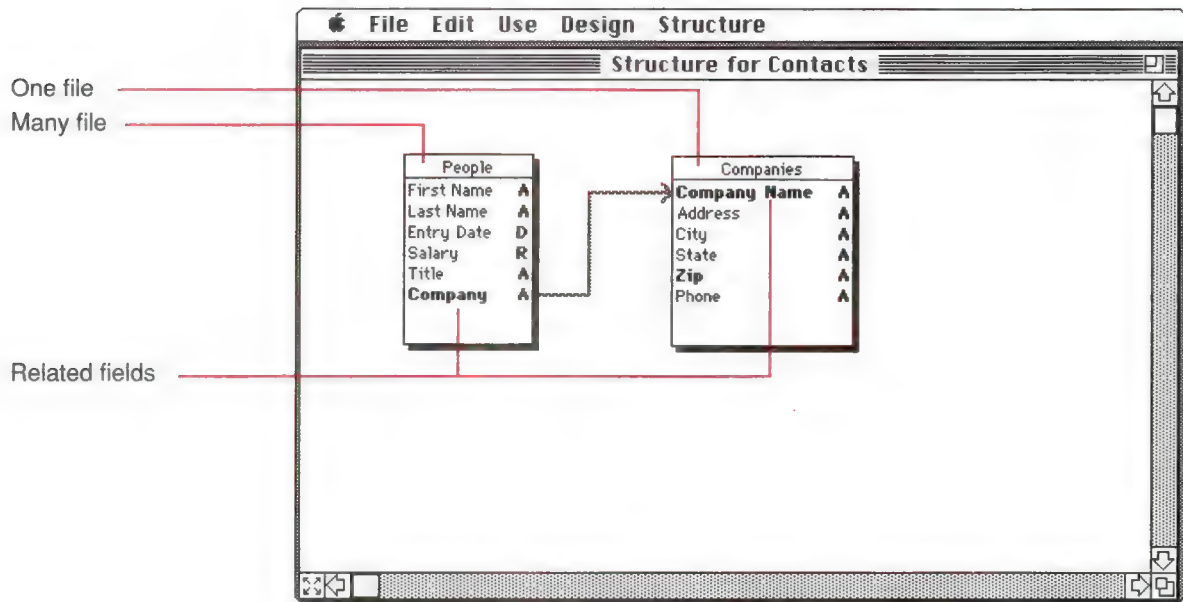


Figure 2-27
Files related

The arrowhead on the line points to the One file.

Removing Relations

4th DIMENSION lets you remove a relation by deleting the arrow that relates the two fields.

1. In the Structure window, in the Many file, move the pointer over the field name of the relating field.
2. Hold down the mouse button and drag over any empty area between file images.
3. Release the mouse button.

4th DIMENSION removes the arrow. The files are no longer related.

field - Company - Department

file - Companies - [Departments]

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CREATING AND MODIFYING LAYOUTS

CHAPTER 3



CREATING AND MODIFYING LAYOUTS

Layouts allow you to control how information is entered, displayed, and printed. Layouts are the primary method by which a user interacts with the data in a database.

4th DIMENSION offers you both simplicity and power. Your layouts can provide exactly what your database needs. With a few simple steps, you can create a basic layout, as shown in Figure 3-1.

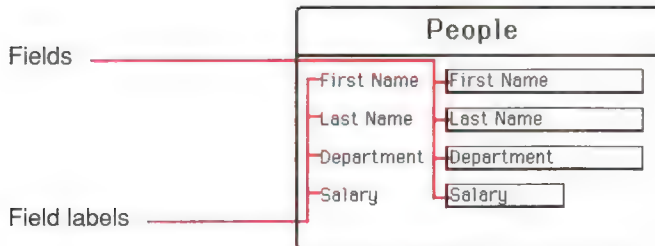


Figure 3-1
A basic layout

You can use the basic layout as it stands, or you can customize it at any time. Figure 3-2 shows a layout that has been customized.

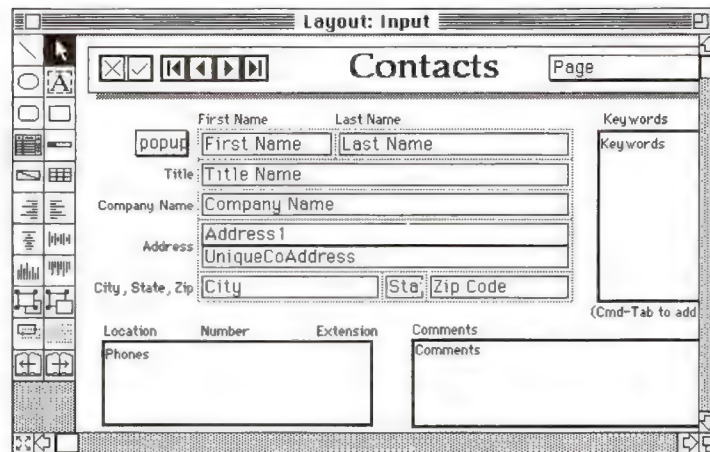


Figure 3-2
A customized layout

This chapter tells you how to

- create layouts for your database
- use the Layout editor to create and modify layout elements
- customize layouts
- copy layouts
- change the data entry order of the fields
- delete layouts
- rename layouts

Layouts, Files, and Fields

Each file must have at least one layout so that information can be entered into the fields and displayed on screen. A file can have any number of layouts, used for different purposes.

In 4th DIMENSION, layouts are designated to be used in two fundamental ways—for input and for output. Generally, you use an input layout to enter and modify information and to view a single record, and you use an output layout to print and display information from several records. However, you can use any layout for either input or output. Your database can feature a single layout for both input and output, or a large number of layouts that perform specific functions. Figure 3-3 shows an input layout and an output layout.

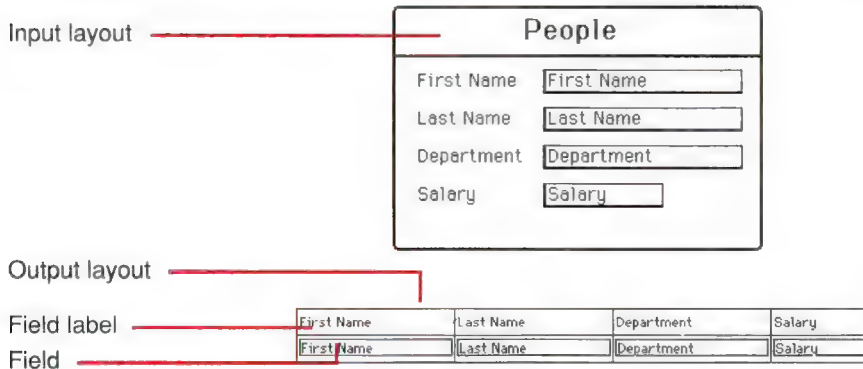


Figure 3-3
Input and output layout

Every layout is associated with a file. The file with which the layout is associated is called its master file. A layout can display fields from more than one file, so one layout may provide data entry or display capabilities for several files.

A particular layout can use some of the fields in a file, or all of the fields. You might have two input layouts, for example—one for use by a clerk and one for use by supervisors—neither of which contains all the fields. You might use another group of fields for the screen display, and yet a fourth group for a printed report.

Some layouts use no fields at all. A dialog box that you create for a runtime application is a layout, but it does not need to use any fields. It can accept information through enterable variables. Figure 3-4 shows several layouts for a single file.

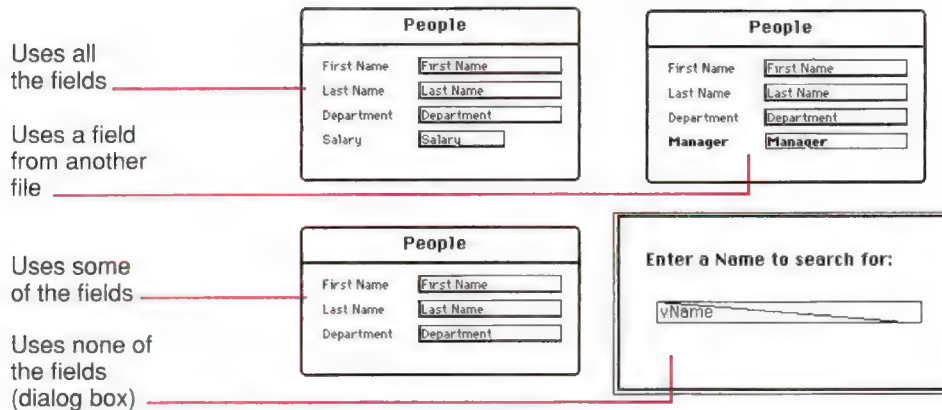


Figure 3-4
Several layouts for a file

Layouts can be modified at any time, whether or not you have entered data into the database. Changes to a layout do not affect the data stored on disk in any way.

Active Objects and Graphic Objects

There are two kinds of objects in a 4th DIMENSION layout: active objects and graphic objects.

Active objects perform operations on data or provide a customized user interface. Active objects include

- fields, including fields from other files
- objects (variables) for entering or displaying data
- buttons for accepting, canceling, or deleting a record
- buttons for moving to other records in the database or to other pages in the layout
- objects such as radio buttons, check boxes, scrollable areas, graph areas, and pop-up menus that use scripts to perform an operation

- external areas that use programs written in other programming languages
- thermometers, rulers, or dials that show relative values
- included layouts that display layouts from other files and subfiles

Graphic objects are geometric or textual elements that enhance the appearance of the layout. Graphic objects include

- shapes, such as rectangles, ovals, circles
- text
- grids
- graphics from applications other than 4th DIMENSION

Figure 3-5 shows several objects on a layout, and identifies which are active and which are graphic objects.

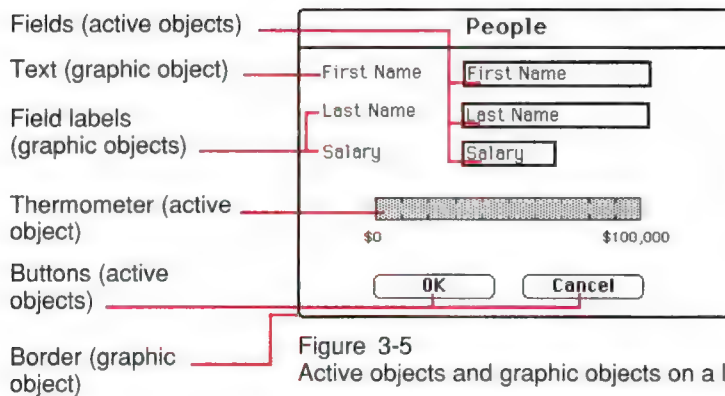


Figure 3-5
Active objects and graphic objects on a layout

All objects, whether active or graphic, are handled in the same way: they are created by being drawn; they can be selected and moved or resized; they can be aligned to each other or to an invisible grid; and their appearance can be changed.

Graphic objects have no impact on the data. You can create a graphic object on a layout simply by drawing it and making any necessary modifications to its appearance. For example, when you create a text area, you draw the area, then you type the text you want to display. You can change the text at any time, without affecting the data.

Active objects require instructions about their relation to the data. When you draw an active object, 4th DIMENSION provides a dialog box that lets you select and enter the necessary specifications. For example, when you place a field on a layout, you draw the field area; then you instruct 4th DIMENSION which field you want to occupy the area. You can change the appearance of the field on the screen (changing its font, style, and

size). You can add data entry controls, and you can associate a script with the field as well.

“Handling Layout Objects,” later in this chapter, gives detailed information about working with objects. Chapter 4 provides complete information about active objects.

Creating a New Layout

You use one of nine layout templates provided by 4th DIMENSION to create the layout. You can then use the Layout editor to modify the layout to suit your needs. This section gives the basic steps for creating a layout. Later sections provide detailed information about selecting fields, using templates, and so on.

To create a new layout, follow these steps:

1. Choose Layout from the Design menu. Or double-click the filename bar of the file for which you want to create a layout.

4th DIMENSION displays the Layout dialog box, as shown in Figure 3-6.

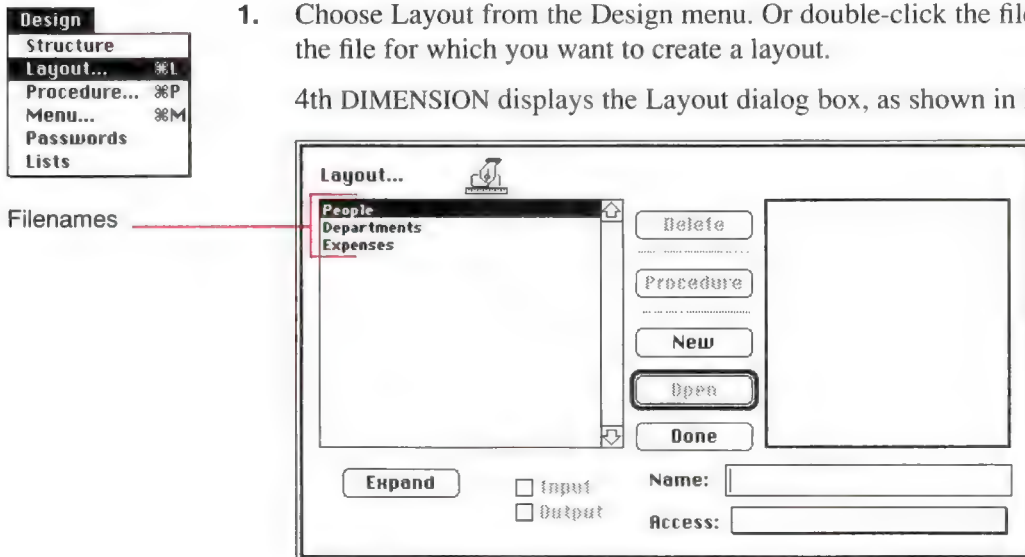


Figure 3-6
Layout dialog box

You use the Layout dialog box to create a new layout, to select an existing layout to work on, and to establish other important specifications for a layout.

4th DIMENSION highlights the first filename in the list of files. Select any of the filenames to create a new layout for that file.

If you opened the Layout dialog box by double-clicking the filename bar in the Structure window, 4th DIMENSION displays only that filename and displays the names of its associated layouts beneath the filename.

2. Select the file for which you want to create a new layout.

This will be the master file for the layout, the file to which the layout belongs.

When you select a filename, the New button becomes active.

3. Click New.

4th DIMENSION displays the New Layout dialog box, shown in Figure 3-7.

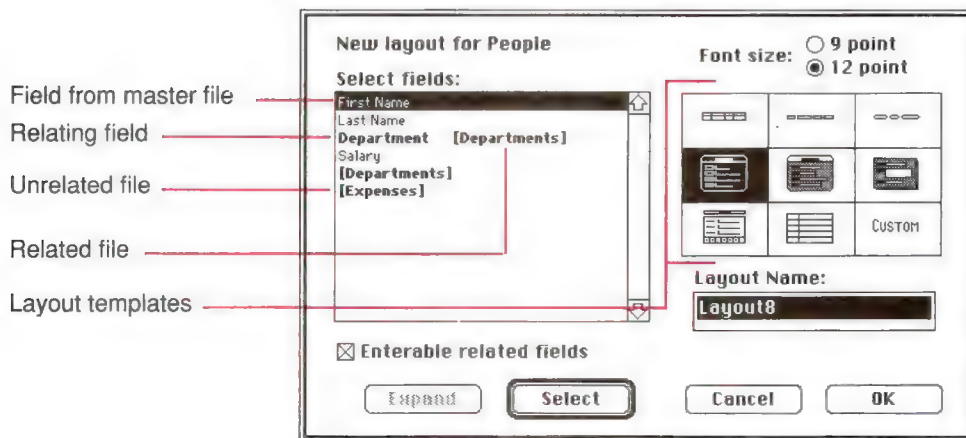


Figure 3-7
New Layout dialog box

Every time you create a new layout, you use the New Layout dialog box. This dialog box provides a list of all the files and fields in the database. You can select any field to display in the layout. In addition, you can choose from nine layout templates, set the font size, and name the new layout.

All the fields from the master file are displayed in the “Select fields” panel. Subfiles are displayed in bold. A related One file is displayed in brackets to the right of the relating field, and all files (whether related or not) are displayed in brackets below the fields from the master file. You select fields for your layout from the “Select fields” panel.

4. Select the fields you want on your layout.

If you want to use all the fields from the master file, do not select any. If you don’t select any fields, 4th DIMENSION acts as if all the fields from the master file were selected.

For complete details about selecting fields for the layout, see “Selecting Fields for the Layout,” the next section in this chapter.

5. Select the template you want to use for your layout.

For complete details about selecting templates for the layout, see “Using Layout Templates,” later in this chapter.

6. Select the default font size you want for your layout.

You can select 9-point or 12-point. This choice determines the default font size for objects that display text. You can set a new default font size in the Layout editor. You can also change the font size for any object in the layout.

7. Type the name you want to use for your layout.

You can enter up to 15 alphanumeric characters for the layout name.

8. Click OK.

4th DIMENSION displays the layout in a Layout editor window. You can customize the layout as necessary. For complete information about customizing the layout, see “Handling Layout Objects,” later in this chapter and all of Chapter 4.

Selecting Fields for the Layout

You select the fields that you want to appear in the layout in the New Layout dialog box. You can select any field from any file in the database, except picture fields. Picture fields must be added to a layout after it has been created.

The order in which you select the fields determines the order in which they first appear in the layout. You can move and modify fields after you create the layout.

You can also add fields to the layout after it has been created.

Using the New Layout dialog box, you can create layouts that display fields from

- the master file
- a related One file (if the master file is the Many file in the relation)

You can create included layouts that display fields from

- subfiles of the master file
- a related Many file (if the master file is the One file in the relation)
- unrelated files

Figure 3-8 shows how the various files and fields are displayed in the New Layout dialog box.

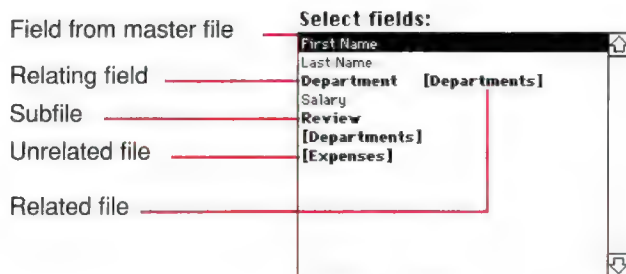


Figure 3-8
Files displayed in the New Layout dialog box

You can expand any file or subfile to display its fields and subfields.

The following sections explain how to select fields from the master file and from a related One file, and how to create an included layout to display fields from a subfile, a related Many file, or an unrelated file.

Selecting Fields From the Master File

If you do not select any fields before you create the layout, 4th DIMENSION includes all the fields from the master file in the new layout, displaying them in the order in which they were created.

If you want to select fewer than all the fields, if you want to select fields from a related file or a subfile, or if you want to change the order in which fields are displayed in the layout, you must select the fields you want to use.

To select fields from the master file, select the name of the first field that you want to include in the layout, then click Select. Or double-click the field name.

4th DIMENSION displays the order number “1” next to the field name.

If a field in the master file is a relating field, double-clicking does not select it. Instead, it expands or collapses the related file’s list of fields. You must select a relating field for the layout by selecting the field and then clicking the Select button.

Repeat this step for each field you want to add to the layout. As you select the fields, 4th DIMENSION displays the order number next to the field name.

Order
number

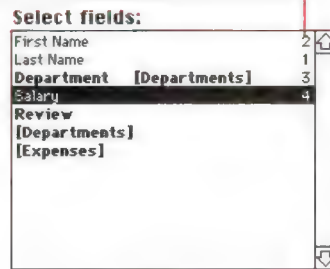


Figure 3-9
Selecting fields from the master file

To deselect fields, do the following:

- Select the name of the field and click Select. Or double-click the field name.

4th DIMENSION removes the order number that appeared next to the field name, and adjusts the remaining order numbers if necessary. If you select the field again, 4th DIMENSION moves it to the bottom of the selection order.

Selecting Fields From a Related One File

You can use fields from a related One file on a layout. The filename of a related file is displayed in brackets next to the relating field.

To select fields from a related One file, follow these steps:

1. Expand the related file to display its fields.
You can expand the file by selecting the relating field and then clicking Expand, or you can double-click the relating field.
2. Select the fields you want to use in the layout, including the fields from the related file.

4th DIMENSION numbers the selected fields in order.

Notice that you cannot use the double-click shortcut to select the relating field, since 4th DIMENSION takes that as a signal to expand and collapse the related file's field names. If you want to include the relating field in your layout, you must use the Select button. You do not have to include the relating field.

Figure 3-10 on the following page shows how fields are selected from the One file in the New Layout dialog box.

T109

Department is field
[Departments] is file

see page 63

Misprint

- *Relating field
exchange Labels
- *Related file
- Expanded fields
from related file
- Order numbers
include fields
from related file
- Check box
selected to allow
data to be entered
in related fields

New layout for People

Font size: ☐ 9 point ☒ 12 point

Select fields:

First Name	2
Last Name	1
Department [Departments]	4
Name	4
Manager	5
Budget	6
Salary	3

Review
[Departments]
[Expenses]

☒ Enterable related fields

Layout Name: **Layout8**

Buttons: Expand, Select, Cancel, OK

Figure 3-10
Selecting fields from a related file

3. If you want to enter data into the related fields, be sure that “Enterable related fields” is selected.

“Enterable related fields” is selected by default. If you inadvertently deselect the check box, you can set Enterable as a layout attribute for each of the affected fields. For information about the Enterable layout attribute, see “Data Entry Controls” in Chapter 4.

When you have completed the steps for creating a new layout and clicked OK, as described earlier in this chapter, 4th DIMENSION creates a layout that includes the fields from the related file. Figure 3-11 shows a layout that displays fields from both a master file and a related One file.

People

Last Name	Last Name
First Name	First Name
Salary	Salary
Department	Department
Manager	Manager
Budget	Budget

Figure 3-11
Layout that displays fields from a related file

Using Included Layouts for Files and Subfiles

When you want to use fields from a related Many file, from a subfile, or from an unrelated file, you use an included layout area. The included layout area can display several records at once. 4th DIMENSION can automatically create an included layout area for fields you select in the New Layout dialog box.

Using an included layout area allows you to view the related records or subrecords. You can also enter information into records and subrecords that are displayed in an included layout. Figure 3-12 shows how a layout with an included layout area looks when displayed in the User environment.

Fields from master file

Records from related Many file

Included layout area

Departments		
Name	Engineering	
Manager	Mr. Johnson	
Budget	785000	
First Name	Last Name	Salary
Peter	Jones	38500
Ann	Burke	42000

Figure 3-12
Included layout area

You can display fields from a related Many file or an unrelated file in an included layout area. If you include fields from a related Many file, the relation determines which records are displayed in the included layout area. If you include fields from an unrelated file, the current selection of records from that file is displayed in the included layout area.

You can include subfields from a subfile in an included layout area. The subrecords for the parent record are displayed in the included layout area. To display different subrecords, the user must display a different parent record.

For complete information about all the features of included layout areas, see “Included Layouts” in Chapter 4.

To create an included layout area with fields from a file or subfile, follow these steps:

1. Select from the master file the fields that you want to appear above the included layout area.
2. Expand the subfile, related Many file, or unrelated file from which you want to use fields.

You can expand the file or subfile by selecting it and then clicking Expand, or you can double-click the file or subfile. Figure 3-13 shows an expanded file.

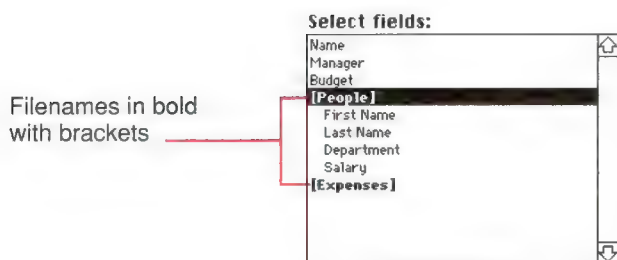


Figure 3-13
Expanding a file before selecting fields

3. Select the file or subfile as if it were one of the fields you want in the layout.

In order to create the included layout area, you must select the file or subfile you want to display in the included layout area. You cannot use the double-click shortcut to select the file or subfile, since 4th DIMENSION takes that as a signal to collapse the list of fields or subfields. To include the file or subfile on your layout, you must use the Select button.

4th DIMENSION places an order number next to the file or subfile you have selected. The order number is required; it indicates the location of the included layout area in the layout.

4. Select the fields you want to use from the file you have expanded, or select the subfields from the subfile you have expanded.

4th DIMENSION starts the order numbers for these fields or subfields from number one again. This subsidiary order number applies to the order in which the fields or subfields will be displayed within the included layout area. Figure 3-14 shows fields from a related Many file selected.

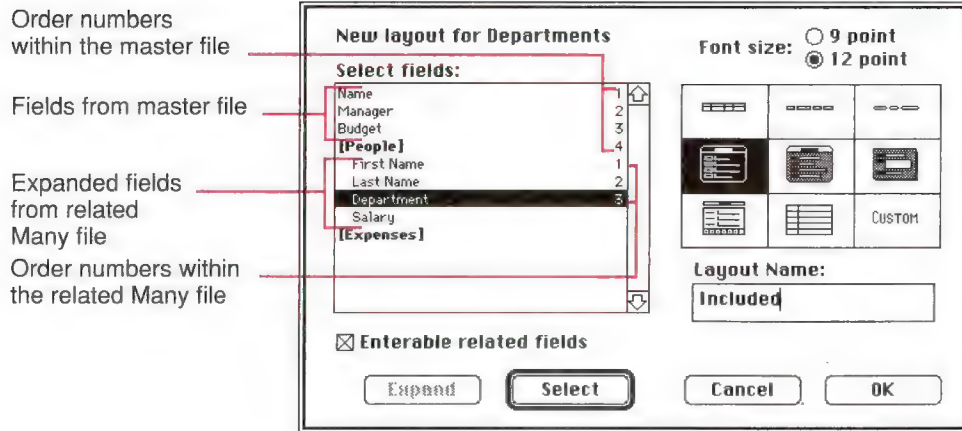


Figure 3-14
Selecting fields from a related Many file

5. Select any other fields you want to appear below the included layout.

When you have completed the steps for creating a new layout and clicked OK, as described earlier in this chapter, 4th DIMENSION creates a layout with an included layout area to display the fields or subfields. Only the included layout area is displayed, not the fields or subfields you have selected. The fields or subfields become visible when the layout is used in the User or Runtime environment.

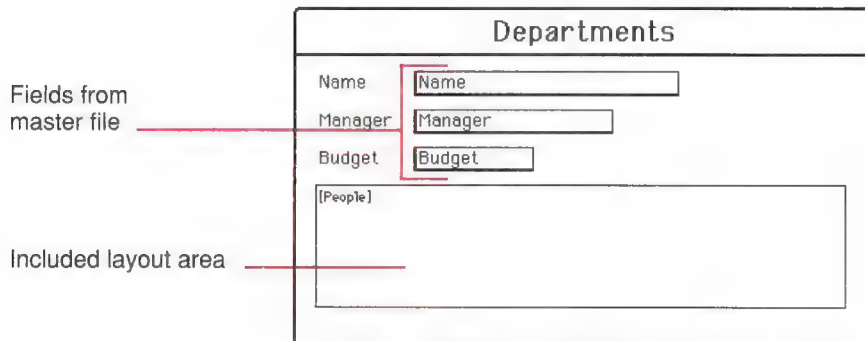


Figure 3-15
Layout with included layout area for related records

Using Layout Templates

The 4th DIMENSION layout templates are displayed on the right side of the New Layout dialog box. 4th DIMENSION uses the template you select as the basis for the layout.

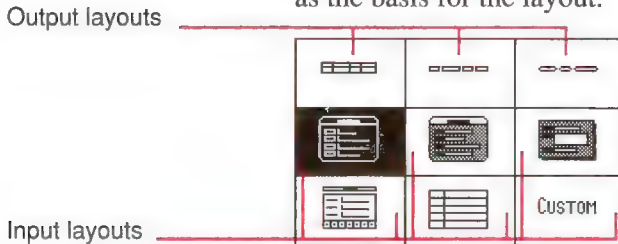


Figure 3-16
Nine layout templates

The first eight templates produce automatic layout designs. 4th DIMENSION creates the layout for you, incorporating the fields you have chosen. Each layout template uses a graphic design that you can modify and adapt to your own needs. The Custom layout template is an empty layout. You add all the fields and layout elements.

Although layouts can be used for either input or output, the templates are designed to fit specific needs. Here are some guidelines:

- Use the single-line templates (1–3) for output—for printed reports or screen display. These layouts let you display records in tabular form which makes it easy to view multiple records.
- Use the boxed templates (4–8) for input—for entering records. In these layouts, records appear one at a time. They are designed for entering single records.

To select a layout template, click one of the nine layout templates displayed on the right side of the dialog box.

4th DIMENSION highlights the selected layout template. You can select any template until you click OK to create the new layout.

Template Choices

Each template provides a distinct layout design. Template 7 provides automatic buttons for handling records; it is discussed at the end of this section. Figures 3-17 through 3-24 show the type of layout produced by each of the layout templates.

Last Name	First Name	Start Date
Johnson	Tom	1/5/87
Bentley	Alice	3/6/87
Davis	Biff	1/2/80
Ransome	Shirley	1/11/80
Wolfram	Lance	1/14/80
Hanson	Dennis	1/14/80
Vernon	Lydia	1/15/80
Venable	Andy	1/15/80
Pfaff	Bryan	1/22/80

Figure 3-17
Template 1 as an
output layout

Johnson	Tom	1/5/87
Bentley	Alice	3/6/87
Davis	Biff	1/2/80
Ransome	Shirley	1/11/80
Wolfram	Lance	1/14/80
Hanson	Dennis	1/14/80
Vernon	Lydia	1/15/80
Venable	Andy	1/15/80
Pfaff	Bryan	1/22/80
Borrell	Jim	1/22/80
Heizer	Nancy	1/23/80

Figure 3-18
Template 2 as an
output layout

Johnson	Tom	1/5/87
Bentley	Alice	3/6/87
Davis	Biff	1/2/80
Ransome	Shirley	1/11/80
Wolfram	Lance	1/14/80
Hanson	Dennis	1/14/80

Figure 3-19
Template 3 as an
output layout

Employees	
Last Name	Johnson
First Name	Tom
Start Date	1/5/87

Figure 3-20
Template 4 as an
input layout

Employees	
Last Name	Johnson
First Name	Tom
Start Date	1/5/87

Figure 3-21
Template 5 as an
input layout

Employees	
Last Name	Johnson
First Name	Tom
Start Date	1/5/87

Figure 3-22
Template 6 as an
input layout

Employees	
Last Name	Johnson
First Name	Tom
Start Date	1/5/87

Figure 3-23
Template 7 as an
input layout

Last Name	Johnson
First Name	Tom
Start Date	1/5/87

Figure 3-24
Template 8 as an
input layout

Template 7 provides automatic buttons to handle records. Each button features a distinctive graphic that identifies its function.

First Record	Previous Record	Next Record	Last Record	Delete Record	Previous Page	Next Page	Enter	Cancel

Figure 3-25
Automatic buttons on layout 7

Each button is named; its automatic action is specified; and it has a unique keystroke equivalent. For complete details about creating automatic buttons, see “Automatic Buttons,” in Chapter 4.

The following table gives the keystroke equivalents assigned to each button. For complete details about creating keystroke equivalents, see “Setting a Keystroke,” in Chapter 4.

Table 3-1

Keystroke equivalents for automatic layout buttons

Button	Keystroke
First Record	None
Previous Record	Command–Left Arrow
Next Record	Command–Right Arrow
Last Record	None
Delete Record	None
Previous Page	Page Up
Next Page	Page Down
Enter	Enter key
Cancel	Command–period

Establishing Input and Output Layouts

Each file has one current input layout and one current output layout. They may be the same layout, or they may be different layouts. Typically, you use a single-record layout for input and a multi-line layout for output.

You can change the input and output designations at any time. The user can also establish which layouts to use for input and output, in the User environment.

In the Layout dialog box, a letter “I” appears next to the input layout name, and a letter “O” appears next to the output layout name.

A “B” appears if one layout is used for both input and output.

Figure 3-26 shows how these letters appear in the Layout dialog box.

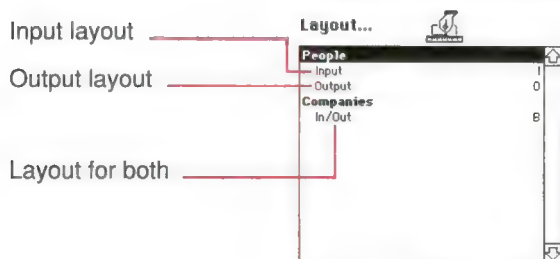


Figure 3-26
Input and output designations

To designate input and output layouts, follow these steps:

1. Choose Layout from the Design menu.
4th DIMENSION displays the Layout dialog box.
2. Select the file whose layout you want to set and click expand to view the layouts.
3. Select the layout you want to use for input.
4. Click the Input check box.
4th DIMENSION places an "I" next to the layout name.
5. Select the layout you want to use for output.
6. Select the Output check box.
4th DIMENSION places an "O" next to the layout name.

Deleting Layouts

You can delete any layout that is not currently designated as an input layout or an output layout (or both). The Delete button is disabled when you select an input or output layout.

1. Choose Layout from the Design menu.
4th DIMENSION displays the Layout dialog box.
2. Select the file whose layout you want to delete and click expand to view the layouts.
3. Select the layout you want to delete.
When you select a deletable layout name, the Delete button becomes active.
4. Click Delete.
4th DIMENSION asks you to confirm the deletion.
5. Click OK.
4th DIMENSION deletes the layout.

Changing a Layout Name

You can change the name of a layout at any time.

To rename a layout, follow these steps:

1. Choose Layout from the Design menu.
4th DIMENSION displays the Layout dialog box.
2. Select the file whose layout you want to rename and click expand to view the layouts.
3. Select the layout you want to rename from the list of layouts on the left side of the dialog box.

Look at the thumbnail display to double-check that this is the correct layout.

4. Edit the name in the Layout name box, or type a new name.
5. Click Done or Open.

4th DIMENSION changes the name of the layout.



Note: Changing a layout name can invalidate any scripts, procedures, or formulas that use the old layout name. Each such item has to be updated in order to work.

Using the Layout Editor

After you create a layout, you can change anything in it. For example, you can add fields to or remove fields from the layout. You can move, resize, and otherwise modify any layout element until the design suits your needs exactly.

This section provides an overview of the Layout editor and describes the tools available for editing layouts. This section also explains how to open a layout in the Layout editor, and describes how a page size is shown on the screen. Subsequent sections describe in detail how to work with the editor's tools.

Layout Editor Overview

4th DIMENSION's Layout editor is a powerful graphics editor that includes features for working with both graphic objects and active objects. Figure 3-27 shows the Layout editor window.

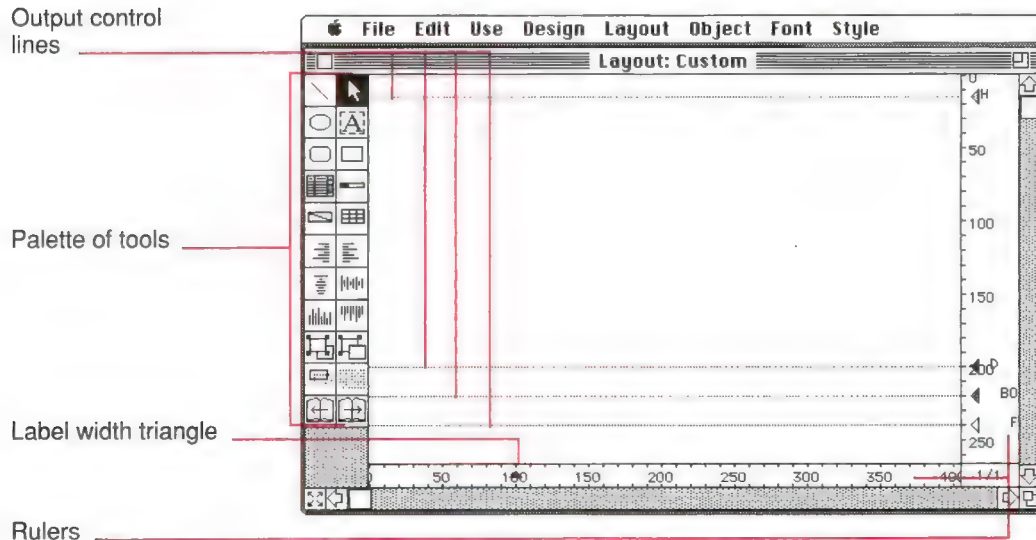


Figure 3-27
Layout editor window

The Layout editor provides a large area in which you can work with objects. The rulers on the side and bottom help you position objects in the layout. You can change the units the ruler uses, so that it measures in inches, centimeters, or points.

The palette of 22 icons provides tools that allow you to create graphic objects for the layout, or add active objects, such as fields, buttons, and included layouts.

The output control lines let you customize a layout for displaying and printing database records. The label width triangle on the horizontal ruler controls the width of a label when you create a layout for printing mailing labels.

The layout menus added to the 4th DIMENSION menu bar provide commands that allow you to change the data entry order of the fields; hide and display the rulers; add a custom menu bar to the layout; control the line width, fill pattern, and color of objects; and change the font and style of the data as it is displayed.

The Layout Palette

The layout palette provides a collection of layout tools for manipulating and modifying the layout. Figure 3-28 shows the Layout palette.

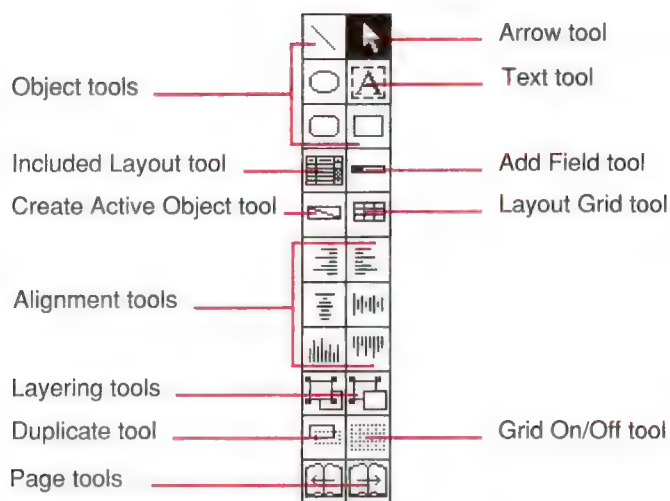


Figure 3-28
Layout palette

Here is a list of the types of tools provided by the palette, with references to the full discussion of their use.

- **Arrow tool:** Used to select, move, and resize objects in the layout. See “Handling Layout Objects,” later in this chapter, for complete information.
- **Text Area tool:** Used to create display text in the layout for labels, titles, instructions, and so on. See “Text Areas,” later in this chapter, for complete information.
- **Object tools:** Used to draw graphic objects such as circles, lines, and boxes. See “Handling Layout Objects,” later in this chapter, for complete information.
- **Included Layout tool:** Used to create an area that displays records from another file. See “Included Layouts,” in Chapter 4, for complete information.
- **Add Field tool:** Used to place a field in a layout. See “Fields in a Layout,” in Chapter 4, for complete information.
- **Create Active Object tool:** Used to create active objects such as buttons, scrollable areas, pop-up menus, and thermometers. See “Working with Active Objects,” in Chapter 4, for complete information.

- **Layout Grid tool:** Used to create a grid on which you can arrange a series of objects. See “Aligning Objects,” later in this chapter, for complete information.
- **Alignment tools:** Used to align objects in the layout. See “Aligning Objects,” later in this chapter, for complete information.
- **Layering tools:** Used to move objects to the front or back in a set of overlapping objects. See “Layering Objects,” later in this chapter, for complete information.
- **Duplicate tool:** Used to duplicate objects. See “Duplicating Objects,” later in this chapter, for complete information.
- **Grid On/Off tool:** Used to turn on or off an invisible grid to which new objects are aligned. See “Aligning Objects,” later in this chapter, for complete information.
- **Page tools:** Used to move to the next page or previous page, or to add additional pages to the layout. See “Creating a Multi-Page Layout,” later in this chapter, for complete information.

The Layout Menu

Use the Layout menu to organize layout elements. Some Layout menu options duplicate operations that you can perform by selecting icons on the layout palette. Figure 3-29 shows the Layout menu.



Figure 3-29
Layout menu

- **Entry Order.** Used to create a custom entry order for data entry objects in an input layout. See “Data Entry Order,” later in this chapter, for complete information.
- **Objects on Grid.** Used to create a series of active objects on a layout grid. See “Objects on a Grid,” in Chapter 4, for complete information.

- **Hide Rulers/Show Rulers:** Used to hide or display the rulers. See “Moving Objects,” later in this chapter, for complete information.
- **Define Grid:** Used to define the scale of an invisible grid to which objects are aligned. See “Aligning Objects,” later in this chapter, for complete information.
- **Turn Grid On/Off:** Used to turn on or off the invisible grid. See “Aligning Objects,” later in this chapter, for complete information.
- **Define Ruler Units:** Used to set the scale of the layout rulers. See “Moving Objects,” later in this chapter, for complete information.
- **Menu Bar:** Used to link the layout to a menu bar. See “Layout Menus,” in Chapter 4, for complete information.
- **Add to Layout:** Used to return to the New Layout dialog box to add fields to the layout. See “Creating a Multi-Page Layout,” later in this chapter, for complete information.
- **Delete Page:** Used to delete a page from the layout. See “Creating a Multi-Page Layout,” later in this chapter, for complete information.

The Object Menu

Use the Object menu to modify and manipulate layout objects. Some Object menu commands display a submenu of choices. Figure 3-20 shows the Object menu.



Figure 3-30
Object menu

- **Line Width:** Displays a submenu of line-width choices for lines and borders. See “Changing the Appearance of Objects,” later in this chapter, for complete information.
- **Fill:** Displays a submenu of fill-pattern choices for objects. See “Changing the Appearance of Objects,” later in this chapter, for complete information.

- **Border:** Displays a submenu of border–pattern choices for objects. See “Changing the Appearance of Objects,” later in this chapter, for complete information.
- **Color:** Displays a submenu of color choices for objects. See “Changing the Appearance of Objects,” later in this chapter, for complete information.
- **Move to Front:** Used to move an object in front of all other objects. See “Layering Objects,” later in this chapter, for complete information.
- **Move to Back:** Used to move an object in back of all other objects. See “Layering Objects,” later in this chapter, for complete information.
- **Align to Grid:** Used to align an object to an invisible grid in the layout. See “Aligning Objects,” later in this chapter, for complete information.
- **Group:** Used to combine multiple objects in the layout into groups that you can manipulate as a single object. See “Grouping Objects,” later in this chapter, for complete information.
- **Ungroup:** Used to break grouped objects into individual objects. See “Grouping Objects,” later in this chapter, for complete information.
- **Position:** Used to redefine the boundaries of a selected object, thereby changing its shape and location. See “Resizing Objects,” later in this chapter, for complete information.
- **Duplicate:** Used to duplicate objects. See “Duplicating Objects,” later in this chapter, for complete information.
- **Format:** Used to display the definition dialog box for a field, active object, or included layout. See Chapter 4 for complete information.

The Font Menu

Use the Font menu to apply a font to objects in the layout, and to specify a default font for text objects that you subsequently add to the layout. The appearance of the Font menu depends on the screen fonts that you have installed on your system.

See “Changing the Appearance of Objects,” later in this chapter, for complete information.

The Style Menu

Use the Style menu to apply a text style, alignment, and point size to objects in the layout, or to specify these attributes as defaults for objects that you subsequently add to the layout.

See “Changing the Appearance of Objects,” later in this chapter, for complete information.

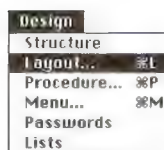
Opening a Layout in the Layout Editor

When you create a new layout, it is displayed in the Layout editor. You can begin customizing it immediately. You can return to any layout to customize it at any time, even after you have used it to enter data.

To open a layout in the Layout editor, follow these steps:

1. Choose Layout from the Design menu. Or double-click the filename bar of the file that you want.

4th DIMENSION displays the Layout dialog box, as shown in Figure 3-31.



Layout selected

List of files and layout names

Thumbnail display

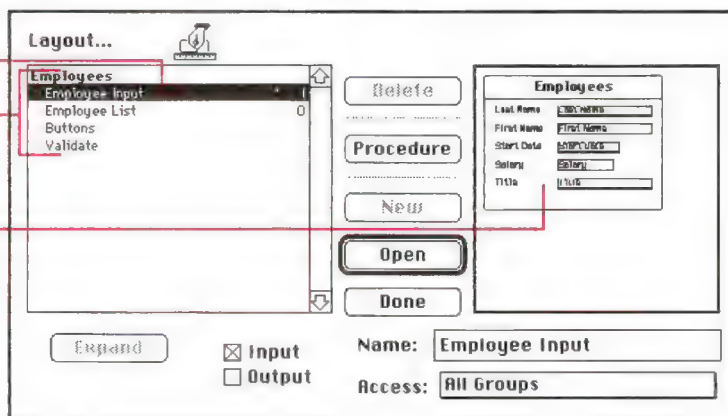


Figure 3-31
The Layout dialog box

4th DIMENSION highlights the first filename in the list of files in the database. You can expand any of the filenames to display the layouts associated with it.

If you double-clicked a filename bar in the Structure window, 4th DIMENSION displays only that filename and expands it to show its associated layouts.

2. If necessary, expand the filename that contains the layout you want to work on.

You can expand the filename either by selecting the filename and clicking Expand, or by double-clicking the filename.

3. Select the name of the layout you want to work on, and then click Open. Or double-click the name of the layout you want to work on.

4th DIMENSION displays the layout in a Layout editor window.

Viewing and Printing Layout Pages

Each 4th DIMENSION layout has an area of about 144 square feet. You scroll to bring hidden portions of the layout into view.

Table 3-2 gives the maximum layout page dimensions in all three layout measurement scales.

Table 3-2
Layout dimensions

Dimension	Points	Centimeters	Inches
Horizontal	10,400	367	144
Vertical	10,250	362	142

For viewing on screen, your layout design can use this entire area. You can view any element you place in the layout.

For printing, layout elements must fit across a single page, but may be several pages in length. The actual size of a page depends on your printing device, the paper it is using, and the specifications you enter in the Page Setup dialog box. 4th DIMENSION displays page border lines in the Layout editor. These lines indicate the page limits. The page border lines respond to any page setup changes. The page setup specifications are stored with the layout when it is closed. Figure 3-32 on top of the following pages shows the page border lines.

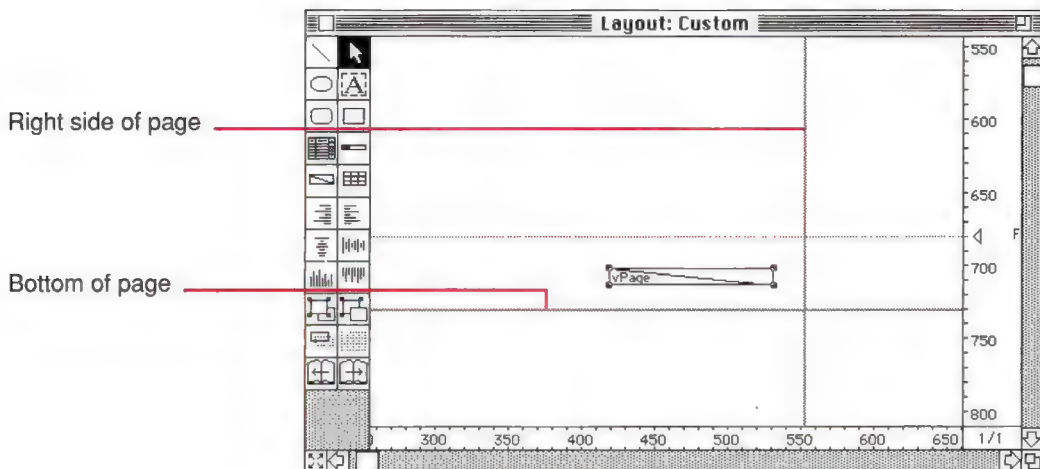


Figure 3-32
Page border lines show area that can be printed

Handling Layout Objects

You customize a layout by creating and manipulating objects in the layout. You use the Layout editor to draw the objects, modify them, arrange them, and delete them.

You can select and modify any object in a layout, including fields and graphic objects created with a template.

Selecting Objects

Before you can perform any operation on an object (such as changing a line width or font), you need to select the object that you want to modify.

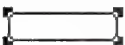
To select an object, follow these steps:



1. Click the Arrow tool in the layout palette.

When you move the cursor into the layout area, it becomes a standard arrow-shaped pointer.

2. Click the object you want to select.



Four resizing handles identify the selected object. To deselect an object, click outside the object's boundary, or Shift-click the object.

Selecting Multiple Objects

You may want to perform the same operation on more than one layout object—for example, to move the objects, align them, or change their appearance. 4th DIMENSION lets you select several objects at the same time. There are two ways to select multiple objects:

- Hold down the Shift key and click the objects you want to select.
- Start at a location outside the group of objects you want to select, and drag a selection rectangle around the objects. You must start dragging in an area that contains no objects.

You can draw a selection rectangle (sometimes called a marquee) by using the arrow pointer. It is a temporary rectangle whose only purpose is to select objects it surrounds or touches.

When you release the mouse button, if any part of an object lies within the boundaries of the selection rectangle, that object is selected. Figure 3-33 shows a selection rectangle being drawn to select several objects.

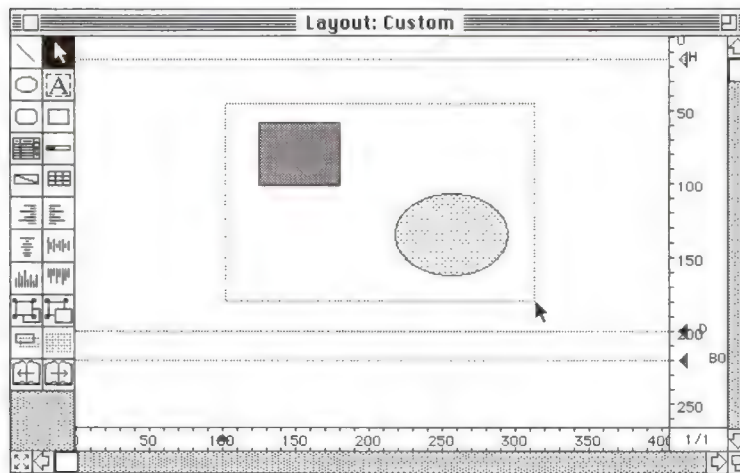


Figure 3-33
Selecting objects with a selection rectangle

i Tip: If you hold down the Control key while you draw a selection rectangle, the editor will select only those objects that are completely enclosed by the rectangle.

To deselect an object that is part of a set of selected objects, hold down the Shift key and click the object. The other objects remain selected. To deselect all the selected objects, click outside the boundaries of all the objects.

Moving Objects

You can move any graphic or active object in the layout, including fields and objects that 4th DIMENSION provided in the original layout.

When moving an object, you have two options:

- Move the object by dragging it.
- Move the object one pixel at a time with the arrow keys.

To move an object by dragging, follow these steps:

1. Select the object or multiple objects you want to move.
2. Move the pointer over the selected object or one of the objects in a selected set of objects, and drag to the new location.

4th DIMENSION displays markers that show the location of the object's boundary in the rulers, so that you can place the object exactly where you want it.

Be careful not to drag a handle. Dragging a handle resizes the object.

3. Release the mouse button to complete the move.

Figure 3-34 shows an object being dragged to a new location.

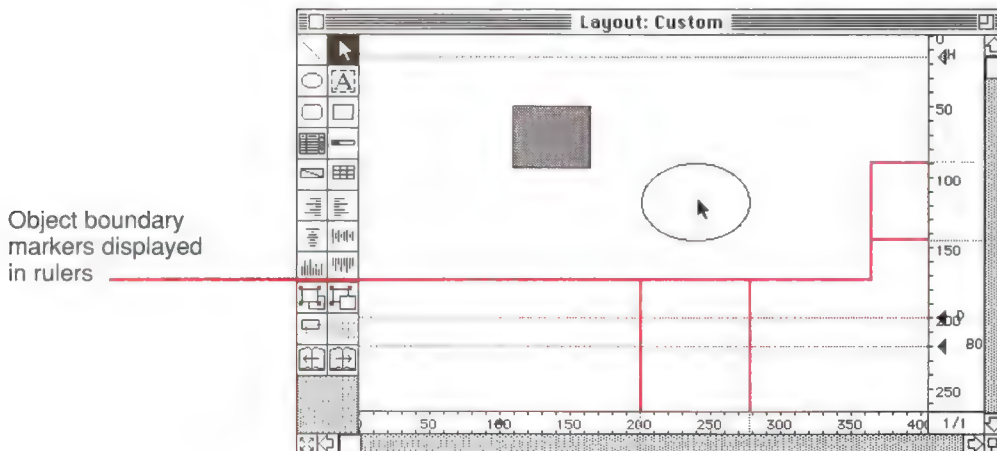


Figure 3-34
Moving an object

To move an object one pixel at a time, follow these steps:

1. Select the object or multiple objects you want to move.
2. Use the arrow keys on the keyboard to move the object.

Each time you press an arrow key, the object moves one pixel in the direction of the arrow.

Resizing Objects

You can change the size of any object that appears in the layout window. 4th DIMENSION lets you stretch or shrink objects on the layout.

When resizing objects, you have two options:

- Resize an object by dragging a resizing handle.
- Use the Position command to enter pixel coordinates for a rectangle that defines the object's dimensions.

To resize an object by dragging, follow these steps:

1. Select the object you want to resize.
2. Move the pointer over one of the four handles that appear on the selected object.

The pointer changes into a multi-directional arrow.

3. Drag the handle toward the center of the object to shrink it, or away from the object's center to enlarge it.

4th DIMENSION resizes the object.

As you drag the handle, the corner of the object opposite the dragging handle remains stationary.

Figure 3-35 shows an object being resized.

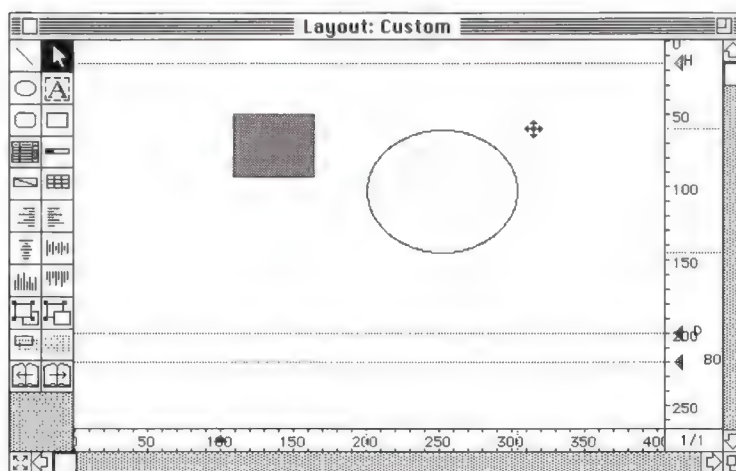


Figure 3-35
Resizing an object



Tip: If you press Shift and then drag the handle, the movement is constrained. Lines can then be only vertical or horizontal; rectangles can then be only square, and ovals can then be only circular.

To resize an object by position, follow these steps:

1. Select the object you want to resize, and then choose Position from the Object menu. Or hold down the Control key and click the object.

The “Object coordinates” dialog box appears, displaying the selected object’s coordinates in pixels, centimeters, or inches (depending on the ruler units). Each pixel corresponds to a dot on the screen. The upper-left coordinates of the layout area are 0,0. Figure 3-36 shows the “Object coordinates” dialog box.

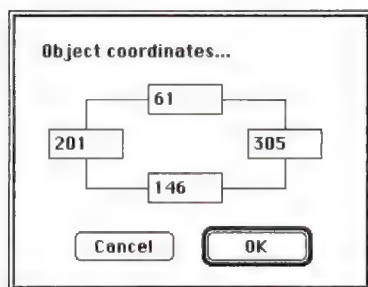


Figure 3-36
The “Object coordinates” dialog box

2. Enter new values in the coordinate entry areas and click OK.

4th DIMENSION moves the boundaries of the object to the positions you defined in the dialog box. The effect is to resize and/or move the object.

Using the Rulers

The 4th DIMENSION Layout editor rulers extend the entire height and breadth of the layout, so you can always see where you are. Use the rulers to position objects in precise locations.

You can hide the rulers to acquire more working space in the Layout editor window. You can display the rulers again when you need them.

You can change the units the rulers use, to suit your preference.

The rulers contain markers that show the position of the pointer when creating or resizing an object. While you are moving the object, the markers change to show the top and bottom of the object, and the left and right sides. Figure 3-37 shows the rulers and object markers.



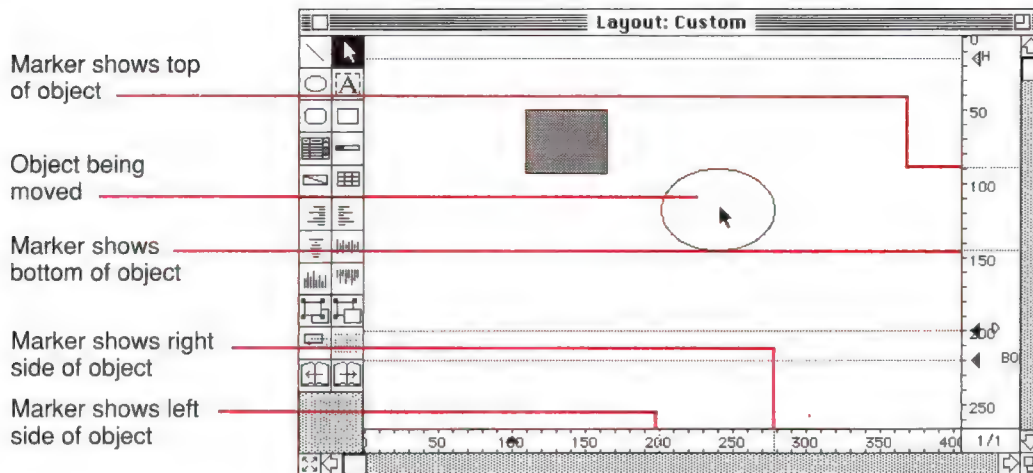


Figure 3-37
Object markers in the rulers

The object markers allow you to align other objects to the same position on the rulers.

To hide or display rulers, choose Hide Rulers (or Show Rulers) from the Layout menu.

To define ruler units, follow these steps:

1. Choose Define Ruler Units from the Layout menu.

4th DIMENSION displays the “Define units” dialog box, shown in Figure 3-38.

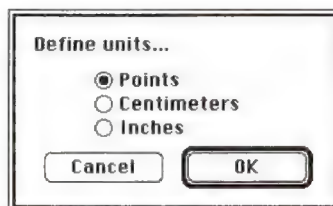


Figure 3-38
“Define units” dialog box

2. Click the measurement scale you want to use
 - Click Points to display rulers that provide measurement in printer’s points. One point is equal to the width of one pixel. There are 72 points in an inch.
 - Click Centimeters to display metric scale rulers.
 - Click Inches to display rulers that use feet and inches.

3. Click OK.

4th DIMENSION changes the measurement units to the scale you have selected. The Object Coordinates dialog box uses the same units. For information about this dialog box, see “Resizing Objects,” earlier in this chapter.

Drawing Objects

Use the tools provided on your layout palette to add active objects and graphic objects to your layout. You select the type of object to draw by clicking the appropriate icon in the palette. Figure 3-39 shows the drawing tool icons on the layout palette.

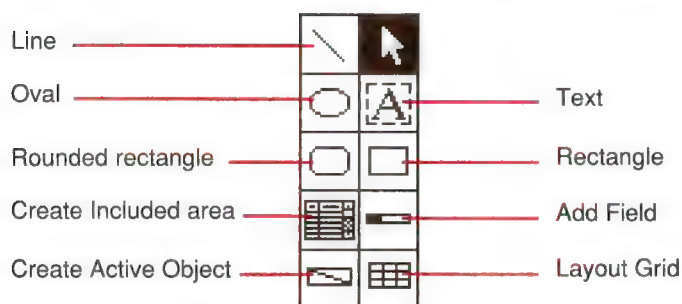


Figure 3-39
Object icons on the layout palette

- **Line tool:** Used to draw a straight line. The line is drawn with the current line width.
- **Oval tool:** Used to draw an oval. The oval is drawn with the current line width and fill pattern.
- **Text Area tool:** Used to create a static text area anywhere in the layout. Use the text tool to add elements such as field labels and instructions.
- **Rounded Rectangle tool:** Used to draw a rectangle with rounded corners. The rectangle is drawn with the current line width and fill pattern.
- **Rectangle tool:** Used to draw a rectangle. The rectangle is drawn with the current line width and fill pattern.
- **Included Layout tool:** Used to draw an area in which to display layouts from subfiles or other files.
- **Add Field tool:** Used to draw an area for a field in the layout.
- **Create Active Object tool:** Used to draw an area for an active object on the layout.

- **Layout Grid tool:** Used to to draw a visible grid in the layout. The grid is drawn with the current line width and fill pattern.

To draw an object, follow these steps:

1. Select the type of object you want to draw by clicking its icon in the palette.

The pointer becomes a crosshair when it is in the layout portion of the layout window, indicating that you can use the mouse to draw the object. The pointer becomes an arrow again when it is positioned over a menu, ruler, or the palette, so that you can use it to select.

2. Drag to create an area for the object.

For two-dimensional objects (ovals, rectangles, fields, grids, text areas, active objects, and included layout areas), drag diagonally. These objects are created within a dotted rectangle that follows the pointer as you drag it. Lines are created between the beginning and end points. Text areas are sized in steps according to the current font and size. Figure 3-40 shows an object being drawn.

Click the icon of the type of object you want to draw

Drag to draw the object

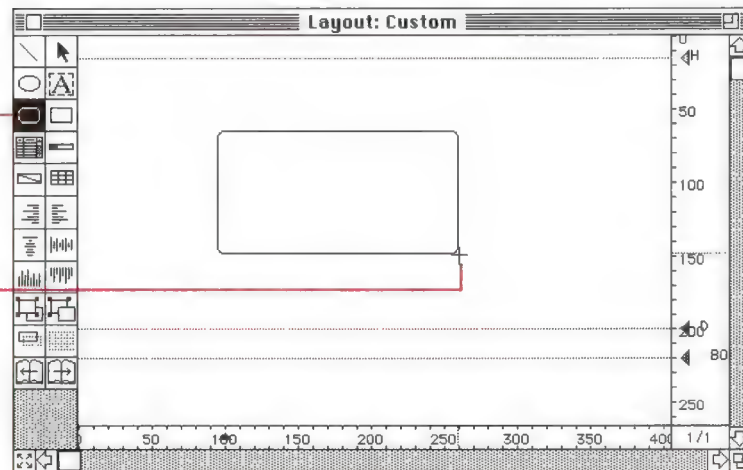


Figure 3-40
Drawing an object




Tip: Press Shift as you draw to constrain the object to a regular shape. Ovals are constrained to circles; rectangles are constrained to squares; lines are constrained to horizontal or vertical.

3. When you have created a satisfactory area or line, release the mouse button.

4th DIMENSION creates the object. It is the currently selected object. The Arrow tool is automatically selected, and the pointer becomes an arrow.

If you created an active object or a layout grid, 4th DIMENSION also displays a dialog box for additional information.

 **Tip:** When you draw several objects of the same type, you may want to avoid having to click the icon each time you want to draw. If you hold down the Command key when you click the layout area, the editor automatically selects and uses the last object tool you used.

Grouping Objects

4th DIMENSION lets you group objects so that you can select, move, and modify the group as a single object.

Objects that are grouped retain their position in relation to each other. You would typically group a field and its border, an invisible button and its icon, and scrollable areas that you use in tandem.

When you resize a group, all the objects in the group are resized proportionally (except text areas, which are resized in steps according to their font sizes).

Groups can be part of other groups. Figure 3-41 shows objects grouped.

Group has handles and individual objects do not have handles

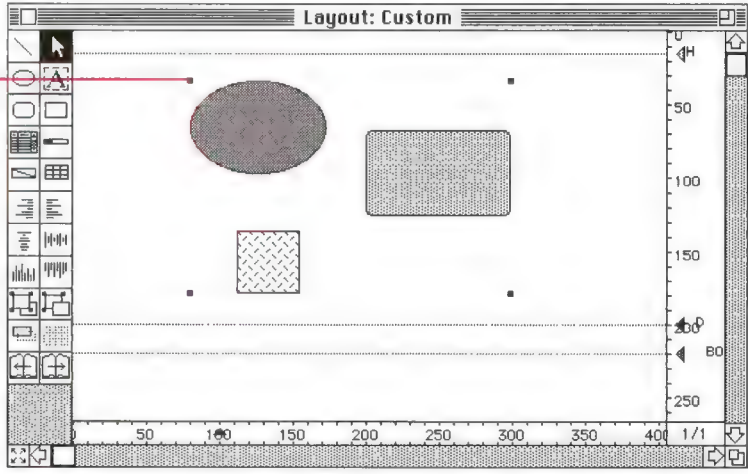


Figure 3-41
Several objects grouped

You can ungroup a group of objects to treat them as individual objects again.

An active object that has been grouped must be ungrouped before you can change its definition or script.

Grouping affects objects only in the Layout editor. In the User environment, grouped objects act exactly the same as if they were ungrouped.

To group objects, follow these steps:

1. Select the objects that you want to group.
2. Choose Group from the Object menu.



4th DIMENSION marks the boundary of the newly grouped object with handles. No handles mark the boundary of any of the grouped objects.

Now, when you modify the grouped object, you change all the objects that make up the group.

To ungroup an object, follow these steps:

1. Select the grouped object that you want to ungroup.
2. Choose Ungroup from the Object menu.



If Ungroup is dimmed, this means that the object is already separated into its simplest form.

4th DIMENSION marks the boundaries of the individual objects with handles.

Aligning Objects

The Layout editor's alignment tools and grid tools let you align objects to each other or to an invisible grid on the layout. When you align an object to another object, you can align it to the top, bottom, side, or horizontal or vertical center of the other object. When you use the invisible grid, you can align an object or collection of objects to grid points on the layout.

Using the Alignment Tools

The alignment tools on the layout palette, shown in Figure 3-42, allow you to quickly align selected objects with each other.

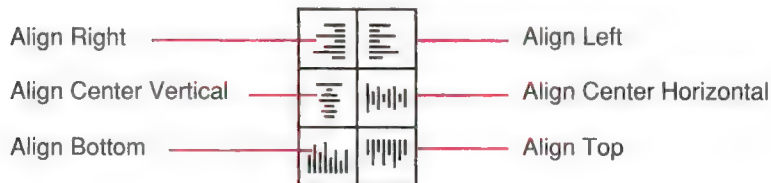


Figure 3-42
Alignment tools on the layout palette

The arrangement of dashes on the icons represents the function of each tool. For example, the Align Right tool shows the dashes aligned vertically on the right side. The Align Center Vertical shows the dashes aligned vertically in the middle.

In a set of objects, 4th DIMENSION aligns the collection to the backmost object. You use Move to Back to establish the base object.

Figure 3-43 shows aligned and unaligned objects.

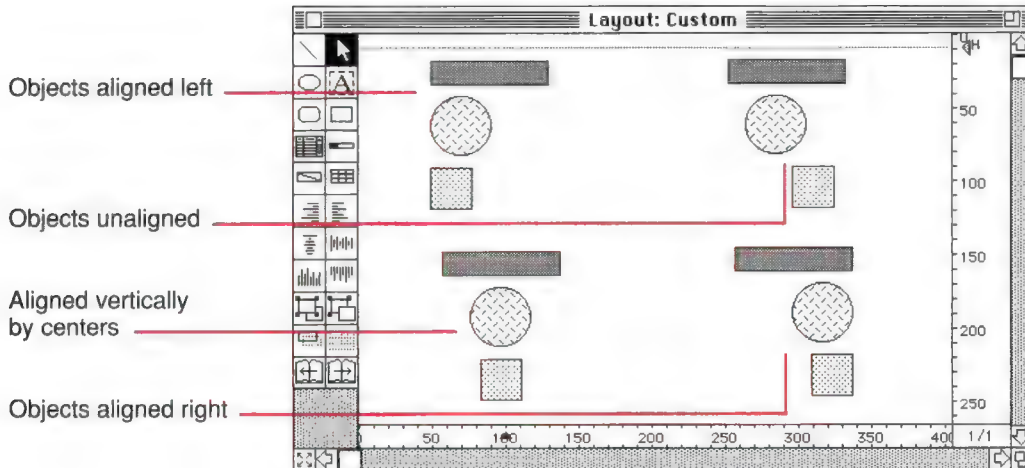


Figure 3-43
Aligned and unaligned objects

To align a set of objects, follow these steps:

1. Select the object to which you want the other objects to align.
2. Click the Move to Back icon, or choose Move to Back from the Object menu.

4th DIMENSION uses the backmost object as the base object. Other objects are aligned to it.

3. Select the objects that you want to align to the first object.

You can select one object or several objects. For information about selecting objects, see “Selecting Objects,” earlier in this chapter.

4. Click the Alignment tool that corresponds to the alignment you want.

4th DIMENSION aligns the selected objects according to the alignment you selected.

Using the Invisible Grid

4th DIMENSION provides a grid of invisible horizontal and vertical lines that help you place and align objects in a layout.

You can

- specify the dimensions of the grid
- turn the invisible grid on or off

If you add an object to the layout while the grid is on, the object's upper left corner is positioned at an intersection of the grid.

Existing layout objects are not aligned to the grid when it is turned on. Instead, each existing object is automatically aligned to its relation to the nearest intersection. If you then move the object, it aligns to the intersections of the grid using the same relation. To align these objects to the new grid, you use the Align to Grid menu command.

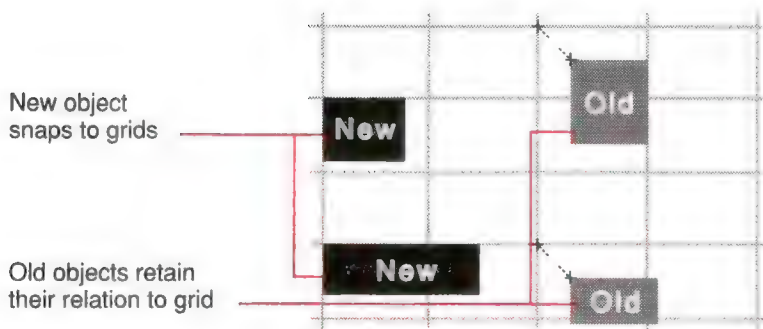


Figure 3-44
An invisible grid to align objects

To define the invisible grid, follow these steps:

1. Choose Define Grid from the Layout menu.

4th DIMENSION displays the “Define grid” dialog box.

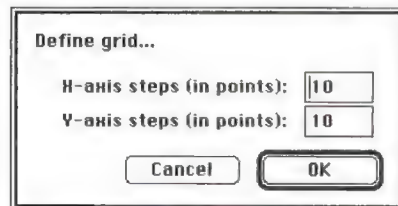


Figure 3-45
“Define grid” dialog box

2. Enter a number of points (72 points to an inch) for each step on the x-axis and y-axis.

Grids are always defined in points.

In effect, you are defining rectangles that are x points wide and y points high. For example, you might specify 10 points for x-axis steps and 20 points for y-axis steps.

If you want the x-axis and y-axis steps to be equal, enter identical point values in the boxes.

The fewer the number of points in a step, the denser the grid. Whatever the density of the grid is, it is always invisible.

3. Click OK to accept the grid settings.

Click Cancel to cancel the settings.



To turn the grid on and off, click the Grid On/Off tool on the layout palette to turn it on.

The Grid On/Off tool is highlighted when it is on, and dimmed when it is off.

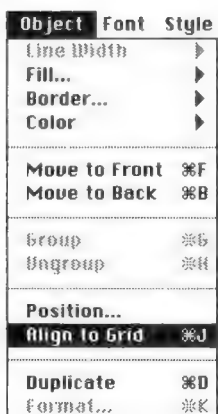
You can also turn the grid on and off by choosing Turn Grid On (or Turn Grid Off) from the Layout menu.



If you choose Turn Grid Off, the Grid On/Off tool on the layout palette is dimmed. If you choose Turn Grid On, the Grid On/Off tool is highlighted.

To align existing objects to the grid, follow these steps:

1. With the grid turned on, select the object or objects you want to align to the grid.
2. Choose Align to Grid from the Object menu.



4th DIMENSION aligns the upper-left corner of the object, or of each object, to the nearest point on the invisible grid.

If you subsequently move the objects, they snap to align with intersections of the invisible grid.

Duplicating Objects

You can create exact duplicates of any object in the layout, including active objects.

Each duplicate is a complete copy of the original object, and retains all the features of the original. Copies of active objects, such as fields and buttons, retain all the specifications for the original, including name, type, action, display format, and any script associated with the object.

If you duplicate an object, move the copy to another location in the layout, and then duplicate the copy (without selecting something else first), the second copy is automatically placed in the same relation to the first copy as the first copy was in relation to the original object. Figure 3-46 shows the same relative placement of the second copy.

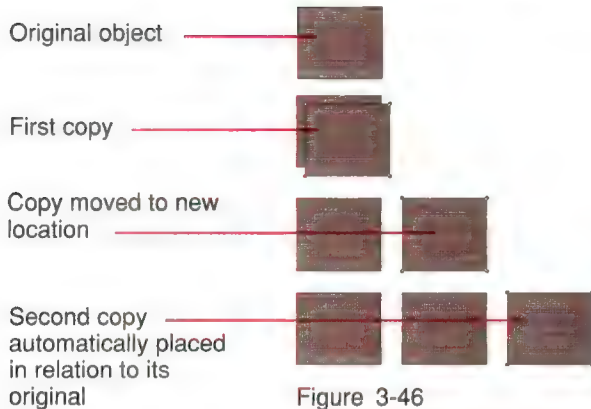


Figure 3-46
Relative placement of duplicated objects

To duplicate an object, follow these steps:

1. Select the object or objects that you want to duplicate.
2. Click the Duplicate tool on the layout palette. Or choose Duplicate from the Object menu.



Object	
Line Width	▶
Fill...	▶
Border...	▶
Color	▶
Move to Front	⌘F
Move to Back	⌘B
Group	⌘G
Ungroup	⌘H
Position...	
Align to Grid	⌘J
Duplicate	⌘D
Format...	⌘K

3. Move the copy (or copies) to the desired location.

If you choose Duplicate again, 4th DIMENSION creates another copy of each object, and moves it the exact same distance and direction from the first copy.

Copying All the Objects on a Layout

You can copy all the objects in a layout page, some of them, or one object. You can use the copied objects in another 4th DIMENSION layout, in the same database or in another database.

You can copy objects and save them in the Scrapbook for later use. For example, suppose you create several custom buttons. You can use the same buttons in any layout in any database, simply by copying them to the Scrapbook and then pasting them into another layout.

Each copy is a complete copy of the original object, and retains all the features of the original. Copies of active objects, such as fields and buttons, retain all the specifications for the original, including name, type, action, display format, and any script associated with the object.



Note: A script copied with an object and placed in a different context may lose its meaning unless it is updated. For example, if you copy an object with a script that refers to a field, and if you place the copy of the object in a database that does not have that field, the script loses its meaning.

To copy all the objects in a layout, follow these steps:

1. Choose Select All from the Edit menu.

4th DIMENSION selects every object on the current layout page.

2. Choose Copy from the Edit menu.

4th Dimension places a copy of the layout on the Clipboard.

3. Create a new layout, using the Custom template.

The new layout is blank.

4. Choose Paste from the Edit menu.

The new layout is an exact copy of the previous layout page. The output control lines are not associated with objects, so they must be positioned on the new layout. See Chapter 5 for information about output control lines.

Layering Objects

As you add objects to your layout, you will sometimes have to rearrange objects that are obstructing your view of other objects in the layout. For example, you may have a graphic that you want to appear behind the fields in a layout. 4th DIMENSION provides two commands, Move to Back and Move to Front, that let you “shuffle” objects in the layout window. Figure 3-47 on the following page shows objects in front of and behind other objects.

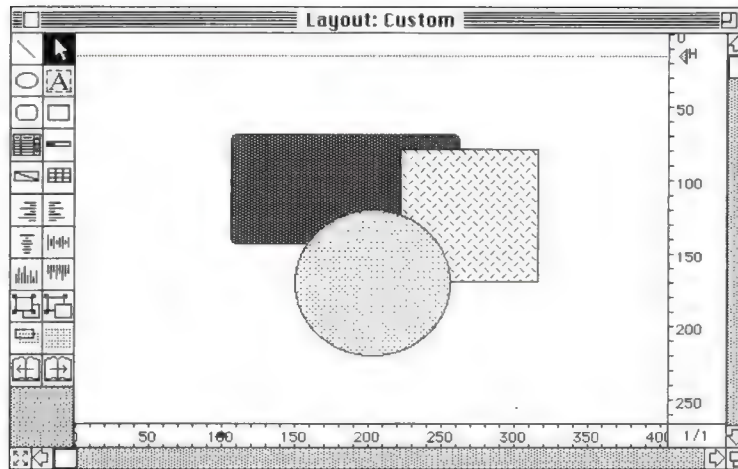


Figure 3-47
Layered objects

To move an object to the back, follow these steps:

1. Select the object or objects that you want to move to the back.
2. Click the Move to Back tool on the layout palette. Or choose Move to Back from the Object menu.

4th DIMENSION moves the selected object or objects behind all the other layout objects.



Note: When you move an object to the back it may be hidden by objects in front of it. To see the object, select the object in front and send it to the back.

To move an object to the front, follow these steps:

1. Select the object or objects that you want to move to the front.
2. Click the Move to Front tool on the layout palette. Or choose Move to Front from the Object menu.

4th DIMENSION moves the selected object or objects in front of all the other layout objects.

Deleting Objects

You can delete any object in a layout. If you want, you can have 4th DIMENSION place a copy of the deleted object on the Clipboard. Objects placed on the Clipboard can later be pasted to new locations in the layout.

1. Select the object or objects you want to delete.
2. Choose Clear from the Edit menu. Or press the Delete (Backspace) key on your keyboard.



4th DIMENSION deletes the selected object or objects.

Or choose Cut from the Edit menu.

4th DIMENSION removes the selected object or objects and places a copy on the Clipboard.

If you change your mind, choose Undo from the Edit menu.

4th DIMENSION restores the deleted object or objects.

Changing the Appearance of Objects

You can change the appearance of any object in a layout. For any object that uses text (a field, a text area, a button, and so forth) you can change the

- font
- style
- size
- alignment within the object's area

For any object that uses lines, fill patterns, or colors, you can change the

- line width
- fill pattern
- border pattern
- color

When you create any object, 4th DIMENSION uses the default settings for these features. You can establish new default settings at any time.

For example, if you establish a new default font, 4th DIMENSION uses that font for any object you subsequently create that displays text.

You can change the settings for a selected object, without changing the default settings. 4th DIMENSION changes the appearance of the selected object, but the change affects only that object. 4th DIMENSION continues to use the default settings for objects created in the layout.

For example, if you change the font for one text area, the change affects only that area, not subsequently created fields or text areas.

This section gives the basic steps for establishing default settings, and for changing the settings for selected objects. It then describes in detail each option for the appearance of objects in a layout.

To establish default settings, follow these steps:

1. Make sure that no object in the layout is selected.
2. Use the commands in the Font, Style, and Object menus to choose the font, size, style, text justification, line width, fill pattern, border pattern, or color.

To change a selected object, follow these steps:

1. Select the object or objects you want to modify.
2. Use the commands in the Font, Style, and Object menus to choose the font, size, style, text justification, line width, fill pattern, border pattern, or color.

The sections that follow describe the options in detail.

Fonts, Styles, Sizes, and Justification

You can specify the font, style, size, and text justification for any object that uses text. These objects can include graphic objects, such as text areas and labels. They can also include active objects, such as fields, buttons, and variables that appear as text when the layout is displayed or printed.

You can specify any font and size supported by the Macintosh system software that you are using. Typically you can make the style

- Plain
- Bold
- Italic
- Underline
- Outline
- Shadow

The font, size, and style settings apply to any text that appears in the object.

4th DIMENSION also lets you specify how you want text or other data justified in an object's area. Justification applies to text within a text object, and to data within active objects. There are four options for justification:

- Align on the right of the area.
- Align on the left of the area.
- Align in the center of the area.
- Use the default justification. The default justification aligns numbers to the right. Text, dates, and times are aligned to the left.



Figure 3-48 shows the different kinds of justification.

	People	
Left-justified text	First Name	Tom
Right-justified text	Last Name	Johnson
Centered text	Company	ABC Corp.
Default justification	Salary	\$35,600
Left-justified number	Bonus	\$1,000

Figure 3-48
Justification

Line Widths

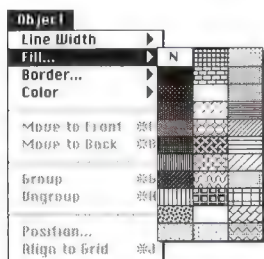


4th DIMENSION lets you specify different line widths for lines and objects that have lines—ovals, grids, and rectangles.

Choose one of the five line widths displayed in the Line submenu of the Object menu. The first width is a hairline, the thinnest line your printer can create.

If you choose Other, 4th DIMENSION displays a dialog box in which you can specify any line width up to 72 points.

Fill Patterns

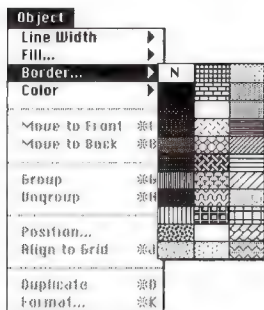


You can apply a fill pattern to any two-dimensional graphic object in the layout—an oval, a rectangle, a line, a grid object, and the area enclosed in a text object.

Choose one of the patterns displayed in the Fill submenu of the Object menu. Double-clicking an object also displays the Fill submenu. Figure 3-49 shows examples of areas filled with patterns.

	Employee Information	
Black fill	First Name	Tom
	Last Name	Johnson
	Company	ABC Corp.
	Salary	\$35,600
Gray fill	Title	Manager

Figure 3-49
Fill patterns



Border Patterns

You can set patterns for the borders of any object in the layout that has a border—an oval, a rectangle, and a grid object. The border patterns available to you are the same as the fill patterns. The appearance of the border also depends on the line width you have specified for the border.

Choose one of the patterns displayed in the Border submenu of the Object menu. Figure 3-50 shows examples of borders using different patterns.

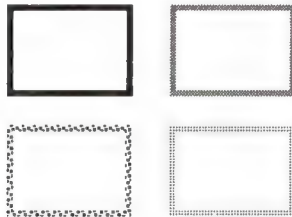


Figure 3-50
Border patterns

Creating a Border

4th DIMENSION lets you automatically create a box to surround and act as a border for a selected object.

To create a border, follow these steps:

1. Select the object.
2. Hold down the Command key and type a number to specify how many pixels you want between the object and the border.

4th DIMENSION draws the border, using the current line width and border pattern.

For example, to obtain a standard Macintosh appearance, data entered in a 12-point Chicago font should have a 3-pixel border. You select the object and press Command-3 to create the border.

Colors

4th DIMENSION lets you add colors to layout objects for display on a color monitor or (if your printer supports color) for color printing. By combining selected colors with fill patterns, you can display thousands of different color shadings.



Note: Colors usually appear black on a black and white monitor. They appear as shades of gray on a gray scale monitor. The color palettes display shades on a gray scale monitor.

You can specify different colors for foreground pixels (“on” pixels that appear black on a black-and-white monitor) and background pixels (“off” pixels that appear white on a black-and-white monitor). On a color display, the mixing of foreground and background colors allows you to create custom tints and shades.

Choose the colors from the Color submenu of the Object menu. The upper palette determines the color of the foreground, and the lower palette determines the color of the background. Figure 3-51 shows the color submenu.

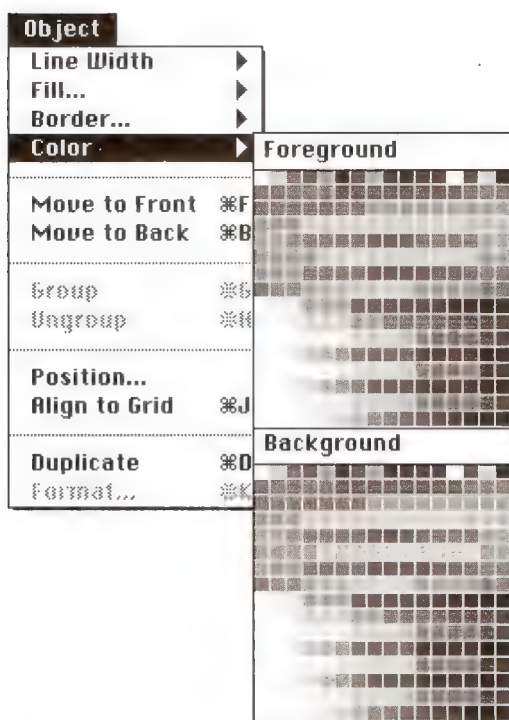


Figure 3-51
Color submenu

If your monitor supports 16 colors, choose the colors from the first 16 colors on each palette. If your monitor supports 256 colors (or more), any colors you choose will display properly.



Note for advanced designers: If you copy a color palette resource into a database structure, 4th DIMENSION uses that palette for the database.

Text Areas

Use text areas to provide labels, titles, and descriptions in your layouts.

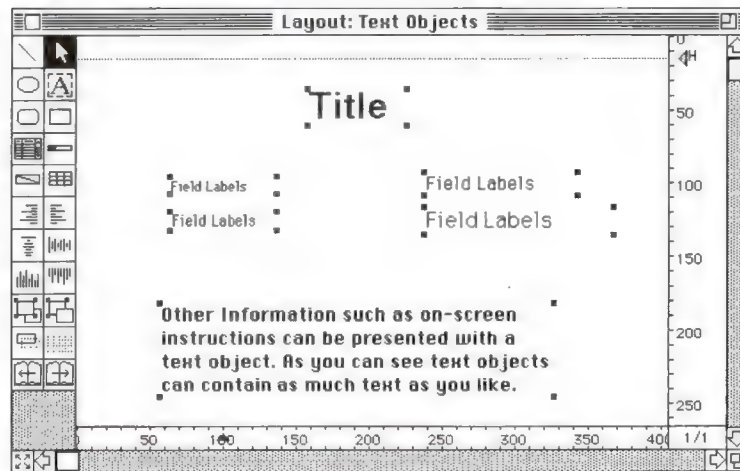


Figure 3-52
Text objects

Text you create in a text area is different from the text contained in a Text field. A Text field contains data stored in the database. The contents can be different in each record. Text in a text area remains the same whenever the layout is displayed. A text area is a graphic object; it is not active.

When you use a layout template to create a layout, 4th DIMENSION automatically creates field labels for the fields. You can modify these labels as you would modify any other text area you add to the layout.

As you draw a text area, it snaps to a size that reflects the font size.

After you create a text area, the text box displays a text insertion point.

Text Area

Figure 3-53
Text area

Type text in the text area. When the text you are typing reaches the edge of the text area, 4th DIMENSION automatically wraps the text to the next line in the area.

If you enter more text than the area can display, the text is not visible until you resize the text area.

You can edit text inside a text area with the standard Macintosh text editing commands.



To modify text in a text area, follow these steps:

1. Click the Text Area icon.
 2. Select the text you want to modify, or click to insert an insertion point.
- Use the standard Macintosh editing commands to edit the text.

Creating a Multi-Page Layout

You can create multiple pages for a layout. If you have more fields than will fit on one screen, you may want to create additional layout pages to display them. Multiple pages allow you to

- Place the most important information on the first page, less important information on other pages.
- Arrange fields in smaller groups for easier use.
- Display the same information in different ways on different screens.
- Reduce or eliminate scrolling during data entry.
- Provide space around the layout elements for an attractive screen design.



Important: Layout pages are a convenience used for data entry. They are not for printed output. When a layout is printed, only the first layout page is printed.

There are no restrictions on the number of pages a layout can have. A practical limit may be about 10, which takes the user's needs into account. The same field can appear any number of times in a layout, and on as many pages as you want.

This section tells you how to add and delete layout pages, how to move from page to page, and how to add fields to a new page.

You can re-open the New Layout dialog box to select fields for the additional pages, or you can place fields with the Add Field tool.

Adding a Layout Page

Every layout has a first page. 4th DIMENSION adds pages sequentially after the last layout page. The current page number appears in a box in the lower-right corner of the layout window.

Figure 3-54 shows a layout with several pages.

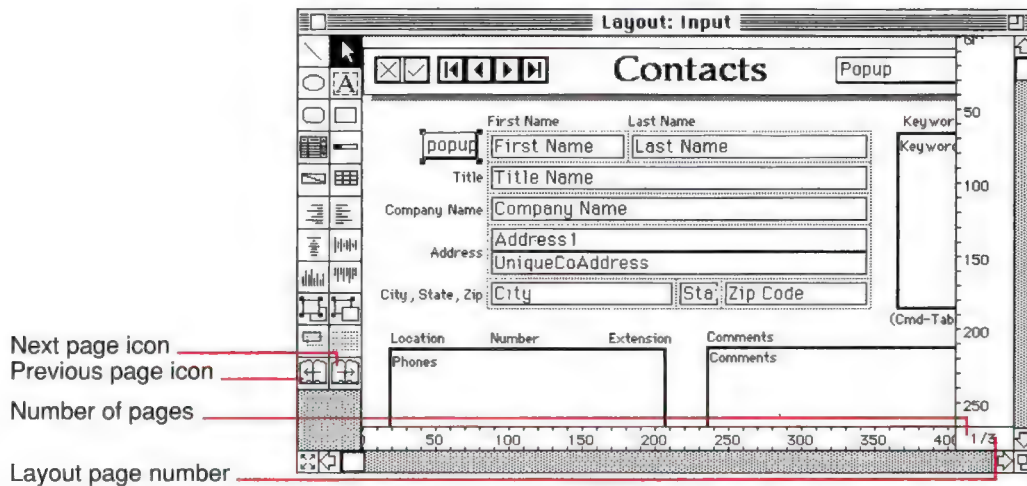


Figure 3-54
Layout with multiple pages

To add a page, follow these steps:

1. Move to the last page on the layout, then click the Next Page icon in the layout palette.
2. Click OK to add another page to the layout.

A new, blank layout page appears in the Layout editor window. The page indicator box in the lower-right corner of the window displays the number of the page you are viewing.

You can now add fields and other layout elements to the new page.

Moving from Page to Page

When a layout has more than one page, you need to move from page to page in order to work on the layout.

To move to the next page, click the Next Page icon on the layout palette.

To move to the previous page, click the Previous Page icon on the layout palette.

4th DIMENSION displays the layout page immediately following or prior to the current page.

If you click Previous Page while viewing the first page of the layout, nothing happens.

If you click Next Page while viewing the last page of the layout, 4th DIMENSION asks if you want to create another page for the layout.

Deleting a Layout Page

You can delete unwanted pages from a multiple-page layout. Any fields or other objects on the deleted pages are deleted as well. The remaining pages are renumbered. You cannot delete the first page.

To delete a page from the layout, follow these steps:

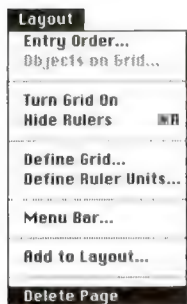
1. Click the Next Page or Previous Page icon to display the layout page you want to delete.

2. Choose Delete Page from the Layout menu.

A dialog box appears, asking if you are certain that you want to delete the page from the layout.

3. Click OK.

4th DIMENSION removes the layout page, and any objects on the page, from the layout.



Adding Fields to a Layout

Every new layout page is blank. You add fields to a new layout page just as you would to any new layout created with the Custom template.

You can add fields in the following ways:

- Use the Add Field icon to place each field.
- Copy fields from other pages or from other layouts, and paste them onto this page.
- Use Add to Layout to return to the New Layout dialog box, in which you can select fields, template, and font size.

The Add to Layout command allows you to add fields to a layout quickly. Usually you use this command when you have added a new page, but you can use it at any time to add fields to any layout.

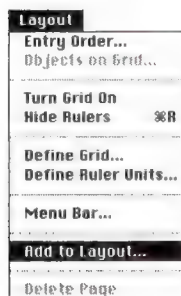
To add fields with Add to Layout, follow these steps:

1. Choose Add to Layout from the Layout menu.

The pointer becomes a corner mark.

2. Click the upper-left corner of where you want the fields to be added.

4th DIMENSION displays the New Layout dialog box, as shown in Figure 3-55 on the next page.



Master file pop-up
menu

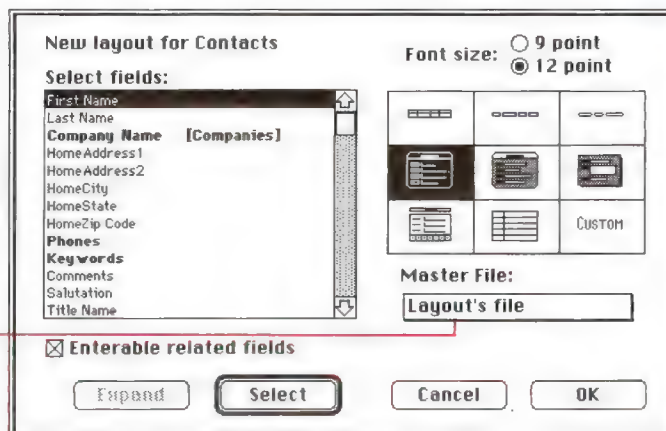


Figure 3-55
New Layout dialog box after Add to Layout

Use this dialog box just as you did when you first created the layout. You select the fields, designate the font size, and select the template you want. In addition, you can change the master file by choosing from the Master File pop-up menu.

You would change the master file only if you wanted to use a template to add fields that look like they belong to the new master file. The title of the layout frame will be the new master filename and the primary fields you can select are from the new master file.

3. Click OK.

4th DIMENSION adds the fields to the layout where you clicked the corner-shaped pointer. The added fields obey the font size and template choices you made in the New Layout dialog box.

Figure 3-56 on the following pageshows fields added with a different template and font size than were used to create the original layout.

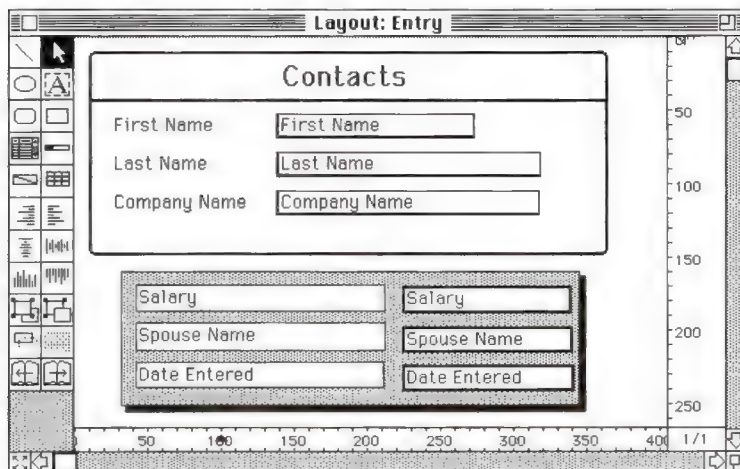


Figure 3-56
Added fields using a different template

You can modify the added elements just as you can any elements in a layout.

Data Entry Order

The data entry order is the order in which fields, included layouts, and other enterable objects are selected as you tab through an input layout. If you don't specify a custom entry order, 4th DIMENSION always selects the upper-left object first, and moves right and down. If two objects are exactly the same distance from the top, 4th DIMENSION selects the leftmost object first. But, if an object is even one pixel higher than an object to the left, the slightly higher object will have precedence.

In some layouts, a custom data entry order is needed. For example, Figure 3-57 shows fields from an employee database. The fields are placed in groups. However, the standard data entry order forces the user to enter the information in an awkward way.

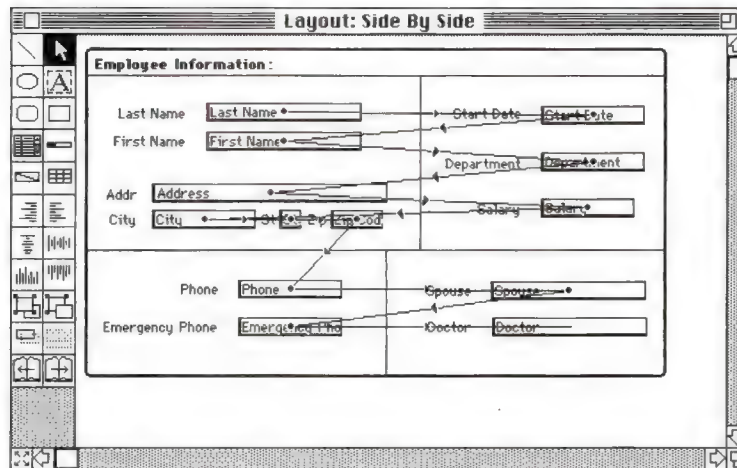


Figure 3-57
Standard data entry order

The custom data entry order, shown in Figure 3-58, allows you to enter the information in a more logical order.

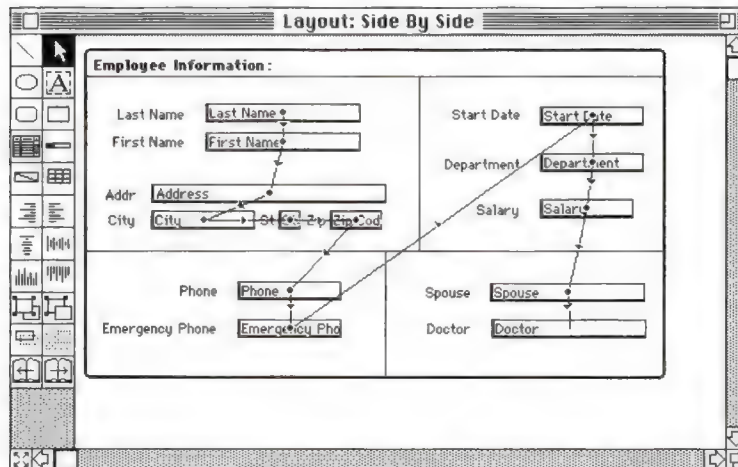


Figure 3-58
Custom data entry order

Viewing and Changing the Data Entry Order

The Entry Order command lets you view the current entry order of all fields in a layout, and allows you to create a custom entry order.

1. Choose Entry Order from the Layout menu.

The pointer turns into an entry order pointer (a small arrow), and 4th DIMENSION draws a line in the layout, showing the order in which it selects objects during data entry.

Layout
Entry Order...
Array on Grid...

Viewing and changing the data entry order are the only things you can do until you click an icon in the layout palette.

2. To change the data entry order, position the pointer on an object in the layout and drag to the object you want next in the data entry order.

4th DIMENSION adjusts the data entry order.

Figure 3-59 shows the data entry order being changed.

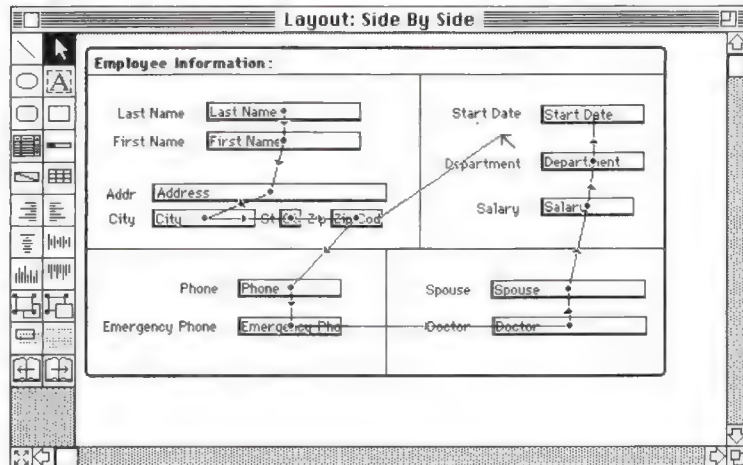


Figure 3-59
Changing the data entry order

3. Repeat step two as many times as necessary to set the data entry order you want.
4. When you are satisfied with the data entry order, click an icon in the layout palette.

4th DIMENSION returns to the Layout editor.

Setting the First Object in the Data Entry Order

All enterable objects are part of the data entry order. To establish one of the objects as the first to be selected, follow these steps:

1. Choose Entry Order from the Layout menu.
2. Drag from the current first object to the object you want to make the first object.

The desired first object becomes second in the data entry order.

3. Drag from the desired first object to the current first object.

The desired first object becomes the first object, and the object that was first becomes second. You can now drag from object to object in order to create the data entry order you want.

4. When you have finished, click any icon in the layout palette.

Using a Data Entry Group

While you are changing the data entry order, you can select a group of the objects in a layout so that the standard data entry order applies to the objects within the group.

To create a data entry group, follow these steps:

1. Choose Entry Order from the layout menu.
2. Drag a selection rectangle around the objects you want to group for data entry.

When you release the mouse button, the objects enclosed or touched by the rectangle take the standard data entry order. The data entry order for the remaining objects adjusts as necessary.

Figure 3-60 shows several fields being selected as a data entry group.

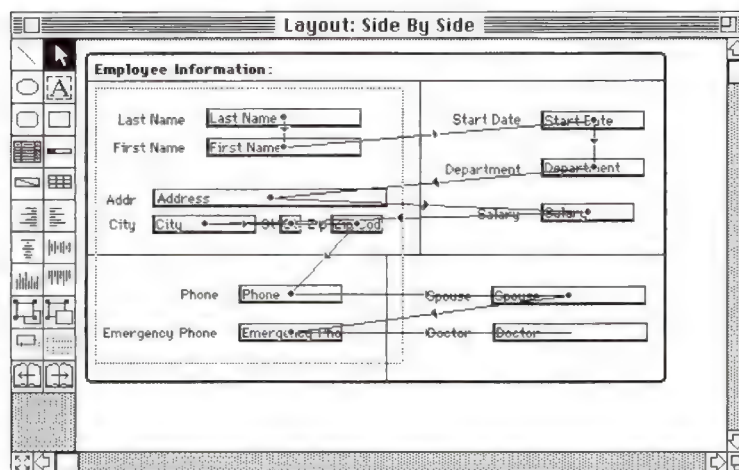


Figure 3-60
Creating a data entry group with a selection rectangle

Figure 3-61 shows the resulting data entry order.

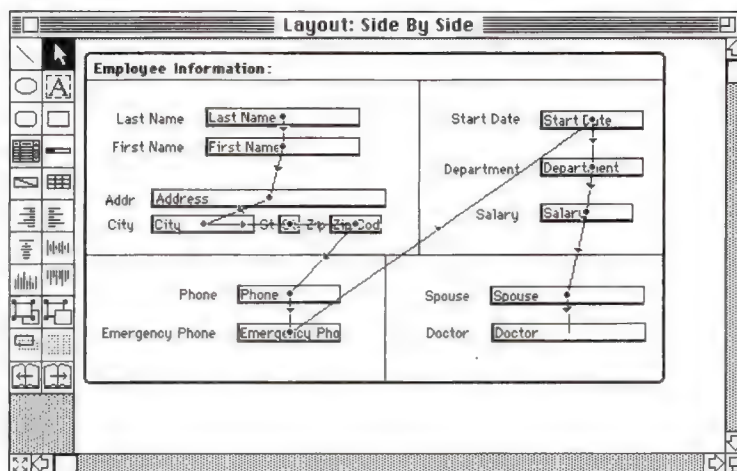


Figure 3-61
Standard data entry order within the enclosed objects

Restoring the Standard Data Entry Order

You can restore the standard data entry order at any time.

1. Choose Entry Order from the Layout menu.
2. Drag a selection rectangle around all the objects on the layout.

When you release the mouse button, the objects enclosed or touched by the rectangle take the standard data entry order.

DESIGNING THE INTERFACE

CHAPTER 4



DESIGNING THE INTERFACE

4th DIMENSION allows you to control almost every aspect of the interface between the user and the database. These aspects include: numeric formats; maximum and minimum acceptable values for a field; and buttons, menus, and other controls. You can use 4th DIMENSION to create an interface that helps the user enter, view, and manipulate information and navigate through the database.

This chapter tells you how to

- place fields and other active objects in the layout
- set display formats for fields and active objects that display numbers, dates, or pictures
- set data entry controls for fields and enterable objects, such as maximum value, minimum value, or required values
- place buttons that accept, cancel, and delete records
- place buttons that move from record to record, or from layout page to layout page
- add pop-up menus where appropriate
- add scrollable areas to display information
- create a grid of active objects
- use scripts to control fields and other active objects
- use included layouts
- add custom menus to layouts

Interface Design Options

4th DIMENSION places no restrictions on how your layout is designed. To begin entering and using information quickly, you can use the standard interface provided by 4th DIMENSION. You can spend a little time making adjustments to the layout so that it becomes more effective for your specific database. Or you can take more time to create a sophisticated interface that uses 4th DIMENSION's programming language. You can design an interface that suits the purpose of the database and the context in which it will be used.

Standard Interface

The standard layout templates are designed to work with the controls in the User environment. The arrangement of fields, field labels, and borders is one aspect of the interface. Another aspect is the set of controls in the control panel. Figure 4-1 shows a typical layout used with the standard 4th DIMENSION controls.

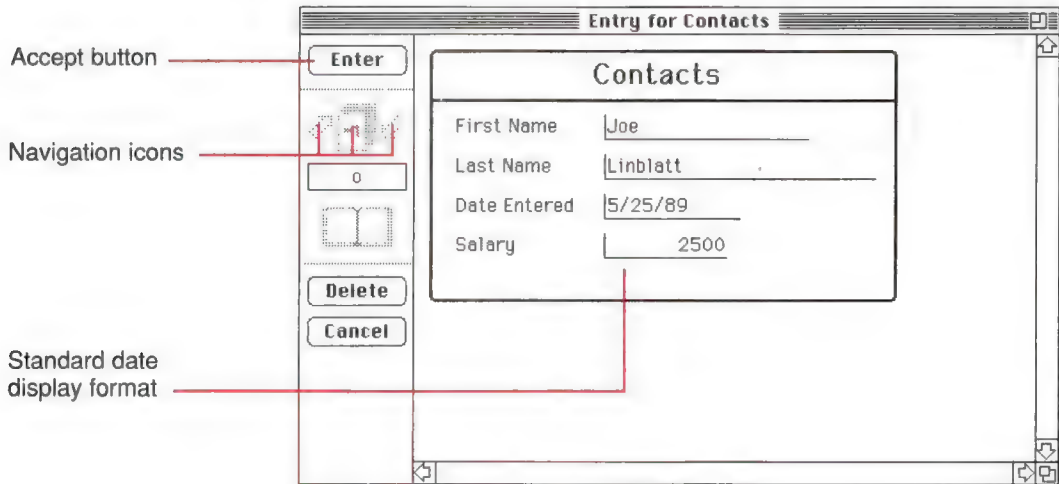


Figure 4-1
Layout for data entry in the User environment

The Enter, Delete, and Cancel buttons work like standard Macintosh buttons. They perform the essential tasks of accepting and deleting records, and of canceling a record that has not yet been accepted.

The navigation icon allows the user to move to the previous record, the next record, and the first record in the database.

The Next Page and Previous Page icons are dimmed in Figure 4-1, because the standard 4th DIMENSION layout is a single-page layout. The user can scroll around the page to find all the fields in a large layout. But you can create a multi-page layout to work more easily with a large number of fields. The Next Page and Previous Page icons then become active in the control panel.

You can create your own buttons to replace the Enter, Cancel, and Delete buttons, and to replace the navigation and page icons. You can place these buttons in a layout without programming. For complete information, see "Automatic Buttons," later in this chapter.

The date and number display formats control the way dates and numbers are displayed. The standard display formats are adequate for many

purposes. You can set the display formats to suit your needs. For example, you can include commas and dollar signs when dollar amounts are displayed. For complete information, see “Field Display Formats,” later in this chapter.

Custom Interface

4th DIMENSION provides interface design features that allow you to change the interface quickly and without programming. These features can make data entry faster, double-check and validate the entries themselves, and provide an attractive and effective display of the information.

Figure 4-2 shows a layout that provides the same features as the standard interface, but is arranged for the particular tasks required.

The figure shows a screenshot of a software interface window titled "Entry for Contacts". At the top is a menu bar with "File", "Edit", "Use", "Enter", "Select", and "Report". Below the menu bar is a toolbar with various icons. The main area is titled "Contacts" and has a "General Info" tab. The form contains several fields: "First Name" (Joe), "Last Name" (Lindblatt), "Title" (Manager), "Company Name" (Acer Paint Technology), "Address" (9087 Industrial Boulevard), "City, State, Zip" (San Carlos, CA, 97834), and a table for phone numbers. The table has columns for "Location", "Number", and "Extension". The "Work" row shows the number (415) 555-1284, and the "Beeper" row shows (415) 555-9563. To the right of the form is a "Key words" field containing "Distributor". At the bottom right is a "Comments" field containing "Good customer".

Figure 4-2
Customized layout for data entry in the User environment

In this layout, custom buttons have replaced the control panel, fields have been moved to more effective locations, display formats have been changed, information from a related file is displayed in an included layout area, and pages have been added to the layout. Invisible changes include choice lists and default values that make data entry easier, data validation controls that reduce errors, and keyboard shortcuts to use in place of the buttons.

These kinds of changes can make a layout fit your needs more exactly. And you can make all these changes simply by providing specifications for the objects. 4th DIMENSION allows you to drag fields into place, place additional fields and buttons, and create basic data validation controls with little effort.

Information about making these kinds of changes can be found in the appropriate places in the remainder of this chapter.

Interfaces Using Scripts and Procedures

4th DIMENSION gives you the power to work with more complex interface features. For example, you might need a scrollable list of choices, or a graph that reflects values in a subfile, or icons that work like radio buttons.

4th DIMENSION provides a programming language so that you can use scripts to control fields, variables, and other objects in your layout. You can attach a script to objects; the script is activated when the user selects or changes the object on the screen.

You can also create global procedures that the user activates by choosing menu items. You can add menus to the standard 4th DIMENSION menus for a particular layout. Whenever that layout is displayed, the user can choose from the menus to activate the procedure.

Figure 4-3 shows an example of a layout with features that use scripts to control them. The layout includes a scrollable area, a graph area, an added menu, and radio buttons. The layout also uses scripts that load values into fields before a record is displayed, change a record in another file based on entries in this layout, and save the other file's record after the record is accepted.

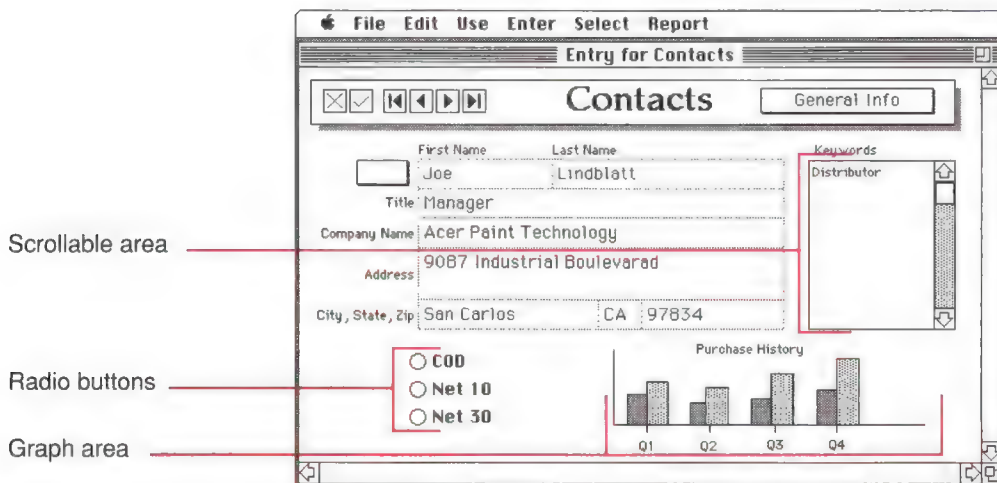


Figure 4-3
Complex data entry layout

For information about attaching a script to an object, see “Scripts,” later in this chapter. For complete information about using the 4th DIMENSION programming language in scripts and procedures, see the *4th DIMENSION Language Reference*.

Active Objects

4th DIMENSION uses two kinds of objects: graphic objects and active objects. Graphic objects, such as borders, field labels, text areas, and titles, perform no active function in the database. Active objects are important elements of an interface, and are discussed in detail in this chapter.

In 4th DIMENSION, an active object is anything in a layout that performs a database or interface function. There are many kinds of active objects. Fields are the primary active objects. Other active objects—buttons, enterable objects, pop-up menus, and so on—store data, invoke a command, or perform some task such as moving from one record to another. Included layouts let you view information from other files and subfiles, and allow you to use their corresponding input layouts. Figure 4-4 identifies several active objects in a layout.

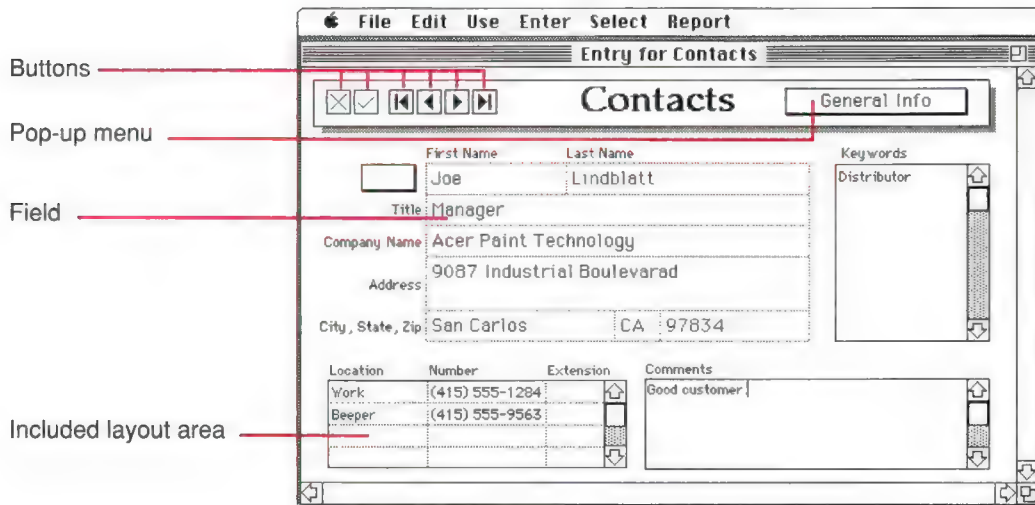


Figure 4-4
Active objects on a layout

Fields in a Layout

Fields provide locations in the layout where you can enter data into a record or where you can display the contents of a record.

When you create a new layout with one of the standard layout templates, you select the fields to include in the layout. Once the layout exists, you can set specifications for each field. You can

- set display formats
- assign data validation controls
- attach a script

These specifications apply only to one layout. You can set the same specifications for other layouts, or you can use different specifications. You can modify the field specifications at any time, and you can place additional fields in or delete fields from any layout.

Field Definition Dialog Box

Whenever you place a field in a layout, or modify the field specifications for a layout, you use the Field Definition dialog box, shown in Figure 4-5.

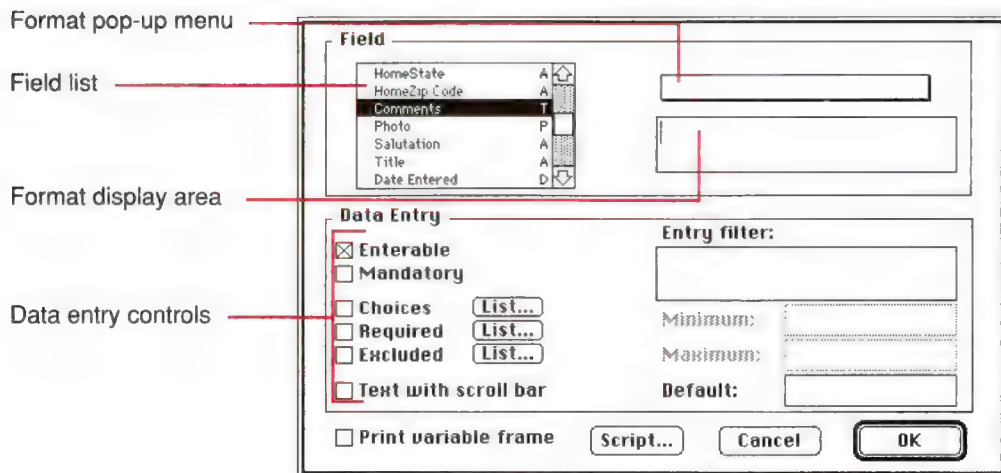


Figure 4-5
Field Definition dialog box

Here are the settings available in the Field Definition dialog box.

- **Field list:** This list lets you select a field from any file in the database. The fields at the top of the list are from the master file. The names of the other files appear in brackets in the field list. You can expand any filename to show its fields.

When you modify a field, you can exchange a field for any other field, simply by selecting the field you want from this list. This is useful when you have accidentally selected the wrong field in the New Layout dialog box, or when you add several fields to a layout at the same time with the Duplicate tool.

Selecting a field from the field list is described in “Placing Fields in a Layout,” later in this chapter.

- **Display formats:** When you select a Number, Date, Time, or Picture field, 4th DIMENSION displays the possible formats for that field in the Format pop-up menu. For example, if the selected field is a Date field, the Format pop-up menu shows a list of date formats. You set the display format by choosing it from the pop-up menu. When the format is chosen, it is displayed in the format display area, where you can edit it if necessary.

If the selected field is an Alpha or Boolean field, you set the display format for the field by typing it in the format display area.

For complete information about display formats, see “Field Display Formats,” later in this chapter.

- **Data Entry controls:** Use the data entry controls to set attributes, lists, a data entry filter, maximum or minimum values, or a default value for the field. For complete information about data entry controls, see “Data Entry Controls,” later in this chapter.
- **Script button:** Use the Script button to attach a script to the field. For information about scripts, see “Using Scripts,” later in this chapter.
- **Text with scroll bar:** You select this check box to add a scroll bar to a text field. The scroll bar allows the user to scroll hidden text into view. For complete information about displaying a scroll bar for a Text field, see “Adding a Scroll Bar to a Text Field,” later in this chapter.
- **Print with variable frame:** You select this check box if you want the Text or Picture field to expand during printing. For complete information about printing with a variable frame, see “Printing With Variable Frame,” later in this chapter.

Placing Fields in a Layout

When you first create a layout, you typically use one of the 4th DIMENSION layout templates to place the fields in the layout. Occasionally, however, you need to place one or more fields in a layout manually. You need to place fields manually in a layout when

- you are using a Picture field
- you discover you need a field you didn't choose in the New Layout dialog box
- you add a field to the database and need to add it to a layout so that you can use it
- you select the custom template in the New Layout dialog box

When you place a field in a layout, you can immediately set a display format, set data entry controls, or add a script.

To place a field in a layout, follow these steps:

1. If the field does not exist in the database, use the Structure editor to create the field.
 2. Open the layout to which you want to add the field.
 3. In the Layout editor window, click the Add Field tool on the layout palette.
- When you move the cursor into the layout area, it becomes a crosshair.
4. Position the crosshair where you want to place one corner of the field.
 5. Drag diagonally to define the size of the field, and then release the mouse button.

4th DIMENSION displays the Field Definition dialog box. You select the field you want from the field list, shown in Figure 4-6.

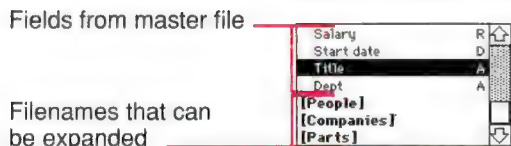


Figure 4-6
Selecting a field from the field list

If the field name you want is not visible, scroll the list until you see it. If the field you want is in another file, double-click the filename to expand the list of fields in that file, then select the field.

6. Select the field you want from the field list.

When you select a field, 4th DIMENSION displays the possible formats for the new field in the Format pop-up menu. For example, if a selected field is a Date field, the submenu shows date display options.

7. (Optional) Choose any display format and data entry controls you want, set printing and display controls for a text field, or attach a script to the field.

These are optional steps. You can perform them now, or return to this field's Field Definition dialog box at any time. The options available in this dialog box are discussed in later sections of this chapter.

8. When you have finished, click OK.

The new field appears in the layout where you drew the field area. The field area displays the name of the field you selected.

After you place a field in a layout, you can handle it as you would any other layout object. You can resize it, change the font, choose colors for display on a color monitor, and so on. And you can return to its Field Definition dialog box to modify the field definition at any time.



Note: Fields from the master file appear twice, once at the top of the list of fields (beneath the empty brackets), and once in the filename's expanded list. If you select the field from the top list, 4th DIMENSION takes this to mean "field in this position in the master file." If you select the field from the filename's expanded list, 4th DIMENSION takes this to mean "this field from this file."

For example, if you select the third field from the top list, and then copy and paste the field into another file's layout, in the new layout it would become the third field in the new master file. If you select the field from the filename's expanded list, and then copy and paste the field into another file's layout, it would remain the same field from the same file.

Modifying a Field in a Layout

You can modify the field definition of any field placed in a layout. If the field has been grouped with another object, you must ungroup it first.

To modify a field's specifications, follow these steps:

1. Select the field you want to work with, and then choose Format from the Object menu. Or double-click the field you want to work with.

4th DIMENSION displays the Field Definition dialog box for that field.

You can change any setting. You can even select a new field to appear in the layout.

2. Make any changes you want, and then click OK.

4th DIMENSION establishes the new specifications for the field.

Object	
Line Width	▶
Fill...	▶
Border...	▶
Color	▶
Move to Front	⌘F
Move to Back	⌘B
Group	⌘G
Ungroup	⌘H
Position...	
Align to Grid	⌘J
Duplicate	⌘D
Format...	⌘K

Field Display Formats

The display formats provided by 4th DIMENSION give you a convenient and flexible method of arranging stored values for screen display and printing. You can determine how the contents of any field except a Text field should be displayed. The format you use to display the contents of a field does not affect the actual value stored by 4th DIMENSION.

You define a display format appropriate to the purpose of the database and the field itself. In a field that stores dollar amounts, for example, you might display a number with dollar signs, commas, and two digits following the decimal point. In a scientific database, you might want a number displayed with 10 digits following the decimal point.

The display format for a field can be different in different layouts. For example, you may want to show a value without dollar signs in an input layout, and display it with dollar signs in an output layout.

You set display formats in the Field Definition dialog box. Different formats appear in the Format pop-up menu, depending on the type of field you select.

Date Field Formats

When you choose a date format, you control the way dates appear when displayed or printed. For data entry, the user must enter dates in the *MM/DD/YYYY* format, regardless of the display format. Figure 4-7 shows date formats in the Format pop-up menu.

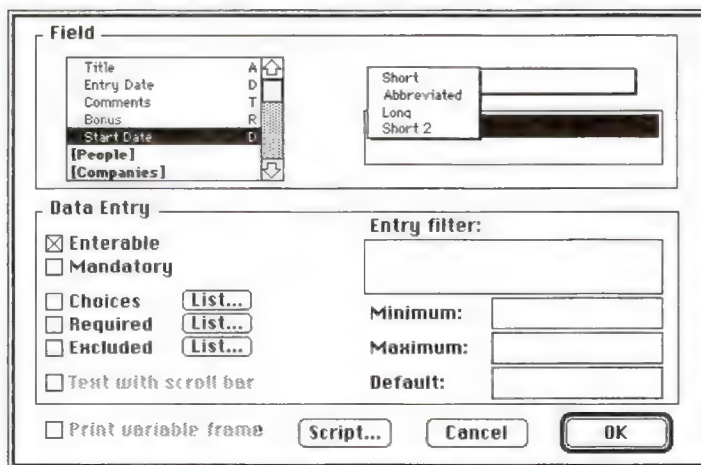


Figure 4-7
Choosing a date display format

Table 4-1 shows the Date field display formats.

Table 4-1
Date Display Formats

Choice	Example
Short	1/16/90
Abbreviated	Tues, Jan 16, 1990
Long	Tuesday, January 16, 1990
Short 2	01/16/1990

Time Field Formats

When you choose a time format, you control the way times appear when displayed or printed. For data entry, the user must enter times in the 24-hour *HH:MM:SS* format, or the 12-hour *HH:MM:SS P* format, regardless of the display format. Figure 4-8 shows time formats in the Format pop-up menu.

The dialog box is titled 'Field'. It contains several sections:

- Field:** A list box on the left shows 'Entry Date', 'Comments', 'Bonus', 'Start Date', 'Start Time' (selected), '[People]', and '[Companies]'. To the right of this list is a small table with two columns: the first column contains 'D', 'T', 'R', 'D', 'H', and the second column contains icons for date, time, and other field types. To the right of the list box is a 'Format' pop-up menu showing options: 'HH:MM:SS', 'HH:MM', 'Hour:Min:Sec', 'Hour:Min', and 'H:MM AM/PM'.
- Data Entry:** A section with checkboxes:
 - ☒ Enterable
 - ☐ Mandatory
 - ☐ Choices (with a 'List...' button)
 - ☐ Required (with a 'List...' button)
 - ☐ Excluded (with a 'List...' button)
 - ☐ Text with scroll bar
- Entry filter:** A section with three input fields labeled 'Minimum:', 'Maximum:', and 'Default:'.
- Buttons:** At the bottom are 'Script...', 'Cancel', and 'OK' buttons.

Figure 4-8
Choosing a time display format

Table 4-2 shows the Time field display formats.

Table 4-2
Time Display Formats

Choice	Example
HH:MM:SS	02:15:34
HH:MM	02:15
Hour Min Sec	2 hours 15 minutes 34 seconds
Hour Min	2 hours 15 minutes
H:MM AM/PM	2:15 AM

Number Field Formats

When you choose a number format, you control the way numbers appear when displayed or printed. For data entry, the user must use numbers, a decimal point if necessary, and a minus sign if necessary, regardless of the display format. Number fields include Real, Integer, and Long Integer fields. Figure 4-9 shows number formats in the Format pop-up menu.

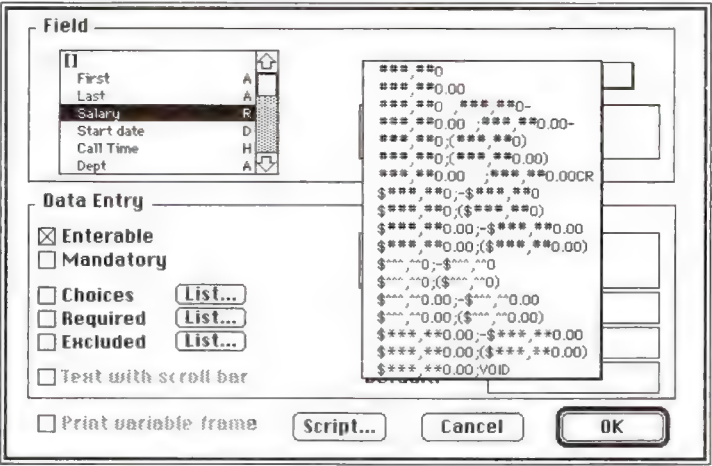


Figure 4-9
Choosing a number display format

You can choose the format from the pop-up menu or type it in the format display area. You can edit any number format in the format display area.

Placeholders

In each of the number display formats, the number sign (#), zero (0), caret (^), and asterisk (*) are placeholders. You use one placeholder for each digit you expect to display. For example, if you want to display three numbers, you could use ###. If the user enters more digits than the format allows, 4th DIMENSION displays <<< in the field to indicate that there is a disparity.

Each placeholder character has a different effect on the display of a leading or trailing zero. (A leading zero is a zero that starts a number before the decimal point; a trailing zero is a zero that ends a number after the decimal point.) The # displays nothing; the 0 displays a zero; the ^ displays a space; and the * displays an asterisk.

For example, suppose you used the format ##0 to display three digits. If the user entered nothing in the field, the field would display 0. If the user entered 26, the field would display 26.

If the user enters a negative number, the leftmost character displays as a minus sign (unless a negative display format has been specified). So if ##0 were the format, a negative 26 would display as -26; a negative 260 would display as <<< because the minus sign needs a placeholder to display and there are only three placeholders.

Table 4-3 shows the effects of each placeholder.

Table 4-3
Number format placeholders

Placeholder	Effect for leading or trailing zero
#	Displays nothing
0	Displays 0
^	Displays a space (see note below)
*	Displays an asterisk



Note: The caret (^) generates a non-breaking (hard) space character (ASCII 202), rather than the true space character (ASCII 20). This is because a non-breaking space is the same width as a digit.

Decimal Point

You can use one decimal point in the format. If you want the decimal to display whether or not the user types it in, it must be between zeros.

Other Characters

You can use any characters other than the placeholders and the decimal point in the format. If they are used alone, or placed before or after placeholders, they always appear. For example, if the format were

`$##0`

a dollar sign would always appear because it is placed before all the placeholders.

If characters are placed between placeholders, they appear only if digits are displayed on both sides. For example, if you define the format

`###,##0`

a comma would appear only if the user enters at least four digits.

Spaces are treated as characters in number display formats.

Formats for Positive, Negative, and Zero

A number display format can have three parts. The three parts allow you to specify display formats for positive, negative, and zero values. The three parts are separated by semicolons:

`Positive;Negative;Zero`

If you use just one part, 4th DIMENSION uses it for all numbers, putting a minus sign in front of negative numbers. If you use two parts, 4th DIMENSION uses the first part for positive numbers and zero, and the second part for negative numbers. If you use three parts, the first is for positive numbers, the second for negative numbers, and the third for zero.

Here is an example of a number display format that shows dollar signs and commas, places negative values in parentheses, and displays nothing for zero:

`####,##0.00;($###,##0.00);`

The presence of the second semicolon instructs 4th DIMENSION to use nothing to display zero. Here is a similar format:

`####,##0.00;($###,##0.00)`

The absence of the second semicolon instructs 4th DIMENSION to use the positive number format for zero. In this case the display for zero would be \$0.00.

Display

&

D/S

1

Entry

Scientific Notation

If you want to display numbers in scientific notation, use the ampersand (&) followed by a number to specify the number of digits you want to display. For example, the format

&3

would display 759.62 as

7.60e+2



Note: The scientific notation format is the only format that will automatically round the displayed number. Note in the example above that the number rounded up to 7.60e+2 instead of truncating to 7.59e+2.

Number Styles

You can use a 4th DIMENSION style to enter a number display format. Type a vertical bar followed by the style name in the format display area. For example, the entry

|Dollars

installs the style named Dollars as the display format for the field.

For information about creating styles, see “Creating Styles,” later in this chapter.

Examples

Table 4-4 shows examples of how different formats affect the display of numbers. The Displays Positive column shows how 1234.50 would be displayed. The Displays Negative column shows how -1234.50 would be displayed. The Displays Zero column shows how 0 would be displayed. The tilde character (~) here represents an Option-space, used to show that a space was entered or that 4th DIMENSION displays a space. The Option-space key combination generates a non-breaking space (also called a hard space). A non-breaking space is the same size as a number for all fonts. Use non-breaking spaces to easily align formatted numbers.

Table 4-4
Number field examples

Format Entered	Displays Positive	Displays Negative	Displays Zero
###	<<<	<<<	
####	1234	<<<<	
#####	1234	-1234	
#####.##	1234.5	-1234.5	
#####0.00	1234.50	-1234.50	0.00
#####0	1234	-1234	0
+#####0;-#####0;0	+1234	-1234	0
#####0DB;#####0CR; 0~	1234DB	1234CR	0~
#####0~; (#####0)	1234~	(1234)	0~
###,##0	1,234	-1,234	0
##,##0.00	1,234.50	-1,234.50	0.00
^ ^ ^ ^ ^ ^	~~~1234	~~~1234	~~~~~
^ ^ ^ ^ ^ 0	~~~1234	~~~1234	~~~~~0
^ ^ ^, ^ 0	~~1,234	~~1,234	~~~~~0
^ ^, ^ 0.00	~1,234.50	-1,234.50	~~~~~0.00
*****	***1234	**~1234	*****
*****0	***1234	**~1234	*****0
, **0	**1,234	*~1,234	**0
, **0.00	*1,234.50	-1,234.50	***0.00
\$*, **0.00; -\$*, **0.00	\$1,234.50	-\$1,234.50	\$*****0.00
\$ ^ ^ ^ 0	\$~1234	\$-1234	\$~~~~~0
~\$ ^ ^ ^ 0; -\$ ^ ^ ^ 0	~\$1234	-\$1234	~\$~~~~~0
~\$ ^ ^ ^ 0~; (\$ ^ ^ ^ 0)	~\$1234~	(\$1234)	~\$~~~~~0~
~\$ ^, ^ 0.00~; (\$ ^, ^ 0.00)	~\$1,234.50	(\$1,234.50)	~\$~~~~~0.00
&2	1.2e+3	-1.2e+3	0.0e+0
	1.23450e+3	-1.23450e+3	0.00000

Note: The <<< characters represent numbers too large for a given format to display.

Alpha Field Formats

When you type a display format for an Alpha field, you control the way the alphanumeric characters appear when displayed or printed. Figure 4-10 shows an alpha format being entered in the format display area.

The dialog box is divided into two main sections: 'Field' and 'Data Entry'.

Field Section:

- A list box contains: Start date, Call Time, Dept, **Phone Number**, [People], [Companies], [Parts].
- To the right of the list box are three small icons: a house, a vertical bar, and a square.
- A 'Format display' text area shows the format: `(###) ###-####`.

Data Entry Section:

- Checkboxes: ☒ Enterable, ☐ Mandatory, ☐ Choices, ☐ Required, ☐ Excluded, ☐ Text with scroll bar.
- Buttons: 'List...' next to Choices, Required, and Excluded.
- 'Entry filter' section with three text areas: 'Minimum:', 'Maximum:', and 'Default:'.
- Bottom buttons: 'Script...', 'Cancel', and 'OK'.

Figure 4-10
Typing an alpha display format

You type and edit the format in the format display area.

The number sign (#) is the placeholder for an Alpha field display format. You can include the appropriate dashes, hyphens, spaces, and any other punctuation marks.

You use the actual punctuation marks you want, and the number sign for each character you want to display.

For example, a U.S. telephone number display format would be,

`(###) ###-####`

When the user enters **1234567890**, the field displays

`(123) 456-7890`

The field actually contains "1234567890".

If the user enters more characters than the format allows, 4th DIMENSION displays the last characters. For example, if the format is

`(###)`

and the user enters **HAPPY**, the field displays

`(PPY)`

The field actually contains "HAPPY".

Alpha Styles

You can use a 4th DIMENSION style to enter an Alpha field's display format. Type a vertical bar followed by the style name in the format display area. For example, the entry

|Phone

installs the style named Phone as the display format for the field.

For information about creating styles, see "Creating Styles," later in this chapter.

Boolean Field Formats

Boolean fields can contain one of two values, TRUE or FALSE. A Boolean field can be displayed as either a pair of radio buttons or as a check box.

Figure 4-11 shows Boolean field formats in the User environment.

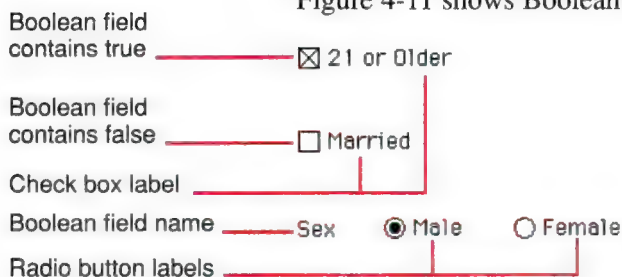


Figure 4-11
Boolean display formats

If you do not create a display format for a Boolean field, 4th DIMENSION automatically displays the field as a pair of radio buttons labeled Yes and No, as shown in Figure 4-12.



Figure 4-12
Standard Boolean field display

You use the format display area to create other labels for radio buttons, or a check box with any label. If you want to display only the button labels, and not the field name, you can delete the field label in the layout.

Formatting a Boolean Field as Radio Buttons

You format a Boolean field as a pair of radio buttons by entering two labels in the format display area, separated by a semicolon. For example, a field for sex could have one button named Male and one button named Female. To create these buttons, you would type

Male;Female

The buttons are displayed side by side. If you use labels with different first letters, the user can select the radio button by typing the first letter. For example, the user can press M to select Male.

The following rules apply when the field is being used for data storage: If the first button is selected, the field is TRUE; if the second button is selected, the field is FALSE. The field is by default FALSE.

Figure 4-13 shows a Boolean field's display format, and the result in the User environment.

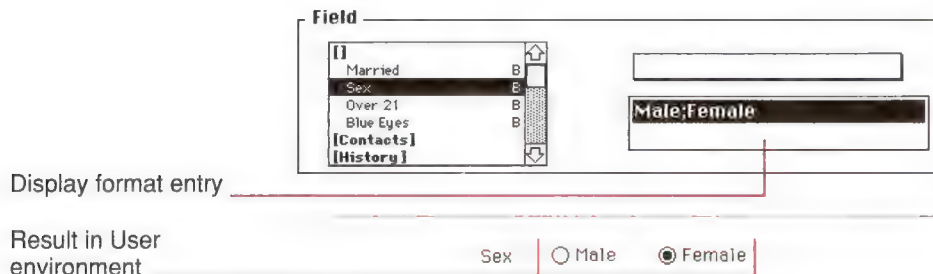


Figure 4-13
Entering button labels for a Boolean field

You do not see the radio buttons and their labels in the Design environment. They are visible in the layout in the User environment.

Formatting a Boolean Field as a Check Box

You create a check box by entering a single label in the format display area. For example a field for Available Now could have one check box labeled Yes. To create this check box you would enter

Yes

To create a check box with no label, enter a space in the format display area.

The following rules apply when the field is being used for data storage: If the check box is selected, the field is TRUE; if the check box is deselected, the field is FALSE. The field is by default FALSE.

Figure 4-14 shows a Boolean field's display format, and the result in the User environment.

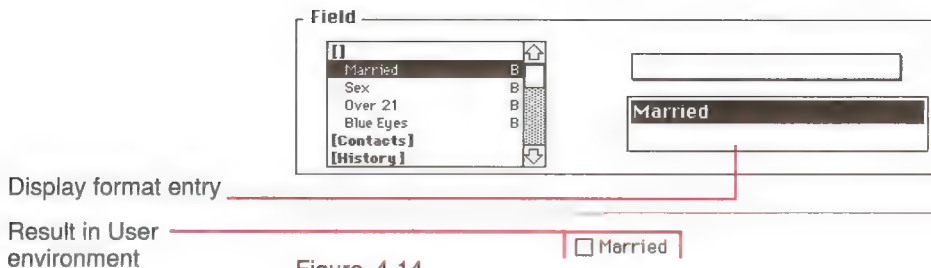


Figure 4-14
Entering check box label for a Boolean field

You do not see the check box and its label in the Design Environment. They are visible in this layout in the User environment.

Picture Field Formats

When you choose a picture format, you control the way pictures appear when displayed or printed. For data entry, the user always enters pictures by pasting them from the Clipboard, regardless of the display format. Figure 4-15 shows picture formats in the Format pop-up menu.

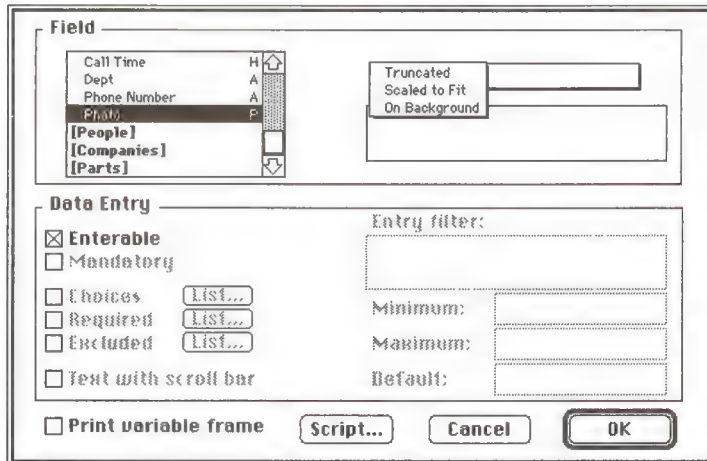


Figure 4-15
Choosing a picture display format

When the user enters a picture into a Picture field, the entire picture is saved in the database file. Only the display is affected by the display format.

Truncated

A Truncated format causes 4th DIMENSION to center the picture in the field and crop any portion that does not fit within the field area. 4th DIMENSION crops equally from each edge and from the top and bottom. Figure 4-16 shows a picture displayed in a field with a Truncated display format.



Figure 4-16
Truncated Picture field

Scaled to Fit

The Scaled to Fit format causes 4th DIMENSION to resize the picture to fit the dimensions of the field area. Because 4th DIMENSION may have to compress or elongate the graphic to fit the field, the picture may appear distorted in the layout. Figure 4-17 shows a picture in a Picture field with a Scaled to Fit format.

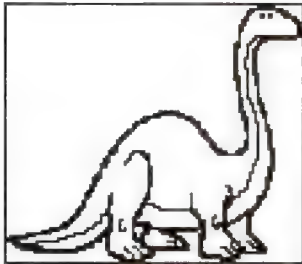


Figure 4-17
Scaled to Fit Picture field

On Background

On Background makes the picture transparent. Any object behind the graphic is visible through the graphic. When a Picture field is in this format, the user can move the picture around the inside of the Picture field by dragging. 4th DIMENSION remembers the position. Figure 4-18 shows a field with an On Background format.

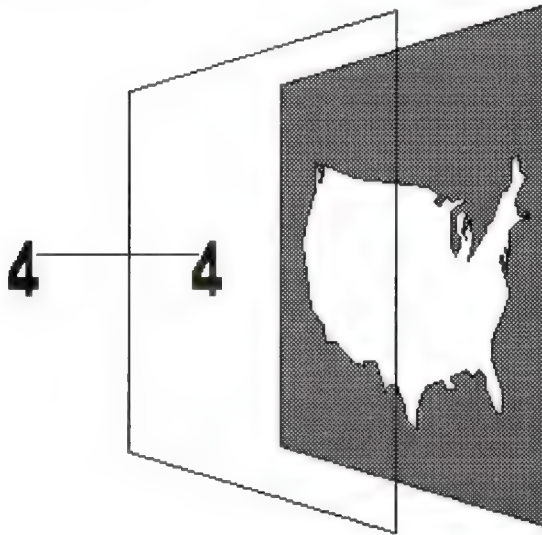


Figure 4-18
On Background picture field



Note: Pictures that are stored in the On Background format are printed as bitmaps.

Data Entry Controls

You can establish data entry controls for fields (and for enterable objects). Data entry controls usually restrict what the user can enter into the field or enterable object. You can

- set the Enterable attribute or the Mandatory attribute
- display a choice list
- establish lists of required values or excluded values
- set an entry filter that defines allowable characters
- set maximum and minimum allowable values
- set default values
- add a scroll bar to text fields

also see:
User Reference
Page 37
"Graphic / Background"
Contrast mode

Setting the Enterable and Mandatory Attributes

You use the two layout attributes, Enterable and Mandatory, to control fields in a layout. You can prevent a user from entering a value into a field by deselecting the Enterable check box. And you can make an entry mandatory by selecting the Mandatory check box. Figure 4-19 shows the Enterable and Mandatory check boxes.



Figure 4-19
Layout attributes

If a field already has the “Display only” attribute assigned in the Structure editor, you cannot make it enterable with the Enterable layout attribute. If a field already has the Mandatory attribute assigned in the Structure editor, you cannot make it non-mandatory by deselecting the Mandatory layout attribute.

The Enterable Attribute

Every field is by default enterable. If you want to make a field non-enterable for that layout, you can deselect Enterable.

A field from a related file may not be enterable, if you deselected “Enterable related fields” in the New Layout dialog box. You can make the related field enterable by selecting Enterable.

For enterable objects, the Enterable check box is dimmed. You can make an enterable object non-enterable by changing the definition of the object from enterable to non-enterable. For information about enterable objects, see “Enterable and Non-enterable Objects,” later in this chapter.

The Mandatory Attribute

No field or enterable object is mandatory by default. If you want to make a field or enterable object mandatory for a particular layout, you can select Mandatory.

Selecting Mandatory makes a field or enterable object mandatory for that layout. 4th DIMENSION does not accept a record if the field or object does not contain a value. For information about enterable objects, see “Enterable and Non-enterable Objects,” later in this chapter.

Assigning Lists

You can assign lists to a field or enterable object in a layout. The list can serve as a choice list, as a list of required entries, or as a list of excluded entries. Figure 4-20 shows the List check boxes.



Figure 4-20
Lists for fields and enterable objects

Assigning a list through the Layout editor gives you the freedom to vary data entry from layout to layout. For example, a field in one input layout can display a choice list, while the same field in another layout does not present a list.

You can assign a list as a field attribute in the Structure editor. The list assigned serves as a choice list, and it appears when the field is selected in any input layout. If you assign a different list to the field in the Layout editor, then for that layout, that list overrides the list assigned in the Structure editor.

Before you can assign a list, you must have created the list in the Lists editor. See Chapter 9 for information on creating lists.

Choice Lists

Assigning a list to a field or enterable object with the Choices check box causes 4th DIMENSION to display the list as a choice list during data entry. A choice list appears when the field or enterable object is selected in the User environment. The user can then select the entry from the list. The user can overwrite the entry chosen from the choice list by typing (unless the list is also a required list).

Required Lists

Assigning a list to a field or enterable object with the Required check box limits the valid entries to the items on the list. For example, you may want to require a list of job titles so that valid entries are restricted to titles that have been approved by management.



Note: Making a list required does not automatically display the list when the field is selected. If you want a required list displayed, assign the same list with the Choices check box also.

Excluded Lists

Assigning a list to a field or enterable object with the Excluded check box prevents the items on the list from being entered. For example, you may want to create such a list for discontinued part numbers.

Assigning a List

To assign a list to a field or enterable object, follow these steps:

1. In the Field Definition dialog box, select Choices, Required, or Excluded, and then click the corresponding List button.

4th DIMENSION displays the List dialog box. It shows the lists you have created in the Lists editor.

2. Select the list you want, and then click Select.

4th DIMENSION assigns the list you have selected to the field or enterable object.

Using Entry Filters

You can apply an entry filter to a field or an enterable object. An entry filter controls exactly what the user can type during data entry. For example, if a part number always consists of three letters followed by three digits, you could restrict the user to that pattern.

An entry filter operates only during data entry. It has no effect on data display after the user leaves the field. Usually, you create a matching display format when you use an entry filter. For complete information about display formats, see “Field Display Formats,” earlier in this chapter.

An entry filter evaluates each character as it is typed. If the user attempts to type an invalid character (a number instead of a letter, for example), 4th DIMENSION simply does not accept it. The character space remains unchanged until the user types a valid character.

You create the entry filter by typing it into the Entry Filter box. Figure 4-21 shows an entry filter being typed.

Entry filter:

!789(###) ###-####

Figure 4-21
Creating an entry filter

The following sections describe how to write the code for an entry filter.

Entry Filter Codes

An entry filter code has three parts:

initiator "argument" placeholders

The initiator informs 4th DIMENSION that the subsequent argument is to be used as a filter during data entry in the field. The argument defines the allowable characters. The placeholders define the places available for the characters.

For example, the following entry filter allows only the letters “a”, “b”, “c”, or “g” to be entered in two places:

&"a;b;c;g"##

In this example, the ampersand (&) is the initiator; the “a;b;c;g” is the argument; and the number signs (#) are the placeholders. The filter can be read as, “Allow the letters ‘a’, ‘b’, ‘c’, or ‘g’ in two places.” Thus the user may enter “ag”, “gc”, “ba”, “ab”, “aa”, “ac” or any other combination of the four allowed characters.

Entry filters can be combined. The following entry filter allows only the letters “a”, “b”, “c”, or “g” to be entered in two places, followed by the numbers 1, 3, or 8 in one place:

&"a;b;c;g"##&"1;3;8"#

The user must use two of the allowed letters, followed by one of the allowed numbers.

Initiating a Filter

Two characters initiate a filter, the ampersand (&) and the tilde (~). These characters instruct 4th DIMENSION to use the argument that follows immediately as the filter for the subsequent placeholders.

In addition, the tilde (~) also instructs 4th DIMENSION to make any letters uppercase. It does not prevent a lowercase letter from being typed; it simply changes it to an uppercase letter.

ENTRY

& ~

Display

Scientific notation

The following entry filters are equivalent in their effects:

`&"P"#`

`~"p"#`

The difference between them is that the filter initiated with the ampersand (&) does not accept a lowercase p; the filter initiated with the tilde (~) accepts the lowercase p but converts it to uppercase.

Because no letters are involved, the following entry filters are equivalent:

`&"1;5;8"#`

`~"1;5;8"#`

Arguments

A filter argument follows the initiator and defines the characters that are allowed in the subsequent placeholders. To create a filter argument, surround the allowable characters with quotation marks.

Arguments are made up of lowercase letters, uppercase letters, numbers, punctuation marks, and special characters (!@#\$%^&*(){}[]";?><.,/~). If you use a lowercase letter in the argument, only the lowercase form of the letter can be typed by the user; if you use an uppercase letter in the argument, only the uppercase form of the letter can be typed by the user.

An argument may be a single character (a letter or a number); for example, "j", "J", or "6".

An argument may be a set of characters separated by semicolons; for example, "a;r;t" or "1;5".

An argument may include ranges of characters. A range is defined by the first character, a hyphen, and the last character. Examples are, "a-c" and "1-5". The "a-c" argument is equivalent to "a;b;c", and "1-5" is equivalent to "1;2;3;4;5".

An argument may include single letters, single numbers, and one or more ranges; for example, "a;m-z;3;5-9".

exclamation mark
! next page

Table 4-5 shows useful shorthand versions of arguments. They are used in filters without quotation marks.

Table 4-5
Entry Filter equivalents

Character	Meaning	Equivalent
9	Allow numbers	"0-9"
a	Allow lowercase and uppercase	"a-z;A-Z"
A	Allow uppercase	"A-Z"
@	Allow alphanumeric	"a-z;A-Z;0-9"

The following entry filters are equivalent:

- &9#
- &"0-9"#
- &"1;2;3;4;5;6;7;8;9;0"#

The following entry filters are equivalent:

- &a#
- &"a-z;A-Z"#

The following entry filters are equivalent:

- &A#
- &"A-Z"#

Placeholders

The number sign (#) is the only placeholder. You use one number sign for each character the user can enter in the field.

For example, the following entry filter allows the user to enter letters in four places:

&a####

The following entry filter allows the user to enter uppercase letters in three places, followed by numbers in two places:

&A###&9##

If you show no placeholders, the filter code allows any number of characters. The following entry filter allows the user to enter only numbers, but it does not limit the length of the entry:

&9

You can set the number of characters allowed in an Alpha field in the Structure editor.

Display Characters

When a field with an entry filter is selected for data entry, 4th DIMENSION displays an underline for each placeholder. As the user types the entry, each underline is highlighted and replaced with the typed character. Figure 4-22 shows a field displaying underlines.

Entry filter placeholders

Parts	
Description	<input type="text"/>
Part No	<input type="text"/>
Unit Price	<input type="text"/> 0
Qty	<input type="text"/> 0

Figure 4-22
Placeholder as an underline

You instruct 4th DIMENSION which character to substitute for the underline by beginning the entry filter with an exclamation point (!) and the character you want. For example, the following entry filter displays the letter “X” in four places prior to data entry:

`!X&"A-M"####`

Figure 4-23 shows X’s being used as display characters.

Entry filter placeholders

Parts	
Description	<input type="text"/> Zwie Billet
Part No	<input type="text"/> XXXX
Unit Price	<input type="text"/> 0
Qty	<input type="text"/> 0

Figure 4-23
Placeholder as an X

You can substitute any character for the underline. Any character other than an underline, however, is saved if nothing is typed over it. For example, if you display “XXXX” in the four places allowed, and if the user types only two of the allowed characters (say they are “AA”) the field will contain “AAXX” when the record is saved.

Dead Characters

Dead characters are displayed during data entry, but they are skipped over by the cursor, and are not entered as part of the data. Any characters, punctuation marks, and spaces can be used as dead characters.

The characters you want to use as dead characters are placed before, after, and between placeholders. They are displayed during data entry for clarity.

For example, the following filter requires three letters followed by three numbers. The two groups of placeholders are displayed as X's enclosed in parentheses.

!X&a(###) &9(###)

The screen display looks like this when the field is selected for data entry:

(**X**XX) (XXX)

If the user enters "abc 123", the screen looks like this:

(abc) (123)

before the user tabs out of the field.

However, the field actually contains this:

abc123

If you want the field to display (abc) (123), you need to create the following display format for the field:

(###) (###)

Examples

Table 4-6 provides several examples of data entry filters.

Table 4-6

Data entry filter examples

Filter	Meaning
&9(###) ###-####	Allow numbers within parentheses and before and after hyphen. (U.S. telephone number format.)
!x&9###-##-####	Display x for each placeholder. Allow nine numbers separated by hyphens as shown. (U.S. Social Security number format.)
&9#####-####	Allow 9 numbers separated by a hyphen. (U.S. 5-4 Zip code format.)
&9#~a###&9###	Allow one number followed by three letters made uppercase, followed by three numbers. (U.S. state license plate format.)

Entry Filter Styles

You can use a 4th DIMENSION style to enter an entry filter. Type a vertical bar followed by the style name in the Entry Filter box. For example, this entry

|Phone

installs the style named Phone as the entry filter for the field.

For information about creating styles, see “Creating Styles,” later in this chapter.

Setting Maximum and Minimum Values

You can restrict a Number, Date, or Time field or enterable object by entering maximum and minimum values in the corresponding boxes.

Figure 4-24 shows minimum and maximum values being entered.

Minimum:	<input type="text" value="100"/>
Maximum:	<input type="text" value="10000"/>

Figure 4-24
Entering values for Maximum or Minimum

During data entry, if the user enters a value below the minimum or above the maximum, an appropriate warning message is displayed. 4th DIMENSION returns the user to the field so that a valid entry can be made.

To set a maximum or minimum value, type the value you want to define the limit. Use the data entry format appropriate for the type of field or enterable object for which you are setting a limit. For example, for a Date field or object, use the date entry format to set the maximum or minimum value.

The value you set is inclusive. That is, if the user enters the same value you have set as a maximum or minimum value, the entry is allowed. Only entries lower than a minimum or higher than a maximum are disallowed. For example, if the value you set as a maximum is 15, the user can enter 15, but not 16.

You can also use a required list to create ranges of allowable values. For information, see Chapter 9, “Creating Lists.”

Default Values

You can assign a default value to be entered in a field or enterable object. The default value is entered when a new record is first displayed. You can change the value unless the field or entry area has been defined as non-enterable.

Figure 4-25 shows a default value being entered.

Default:

Figure 4-25
Entering a Default value

You create a default value by typing the value you want in the Default value box. The default value must be appropriate for the field type.

4th DIMENSION calculates default values for date, time, and sequence number. The date and time are taken from the system date and time.

4th DIMENSION automatically generates a sequence number.

Table 4-7 shows the codes to use for calculated default values.

Table 4-7
Calculated default values

Code	Meaning
#D	Current date
#H	Current time
#N	Sequence number

L270

You can use a sequence number to create a unique number for each record. A sequence number is an integer (whole number) that is generated for each new record. The numbers start at one (1) and increment by one (1). A sequence number is never repeated, even if the record it is assigned to is deleted from the file. Each file has its own sequence numbers.

A default value sequence number should generally not be used in a multi-user database. For more information about using sequence numbers in multi-user databases, see "Managing Multi-User Databases," in the *4th DIMENSION Language Reference*.

Adding a Scroll Bar to a Text Field

Text fields and enterable objects can contain up to 32,000 characters. 4th DIMENSION allows you to attach a scroll bar so that the user can scroll the information. Figure 4-26 shows text fields with scroll bars.

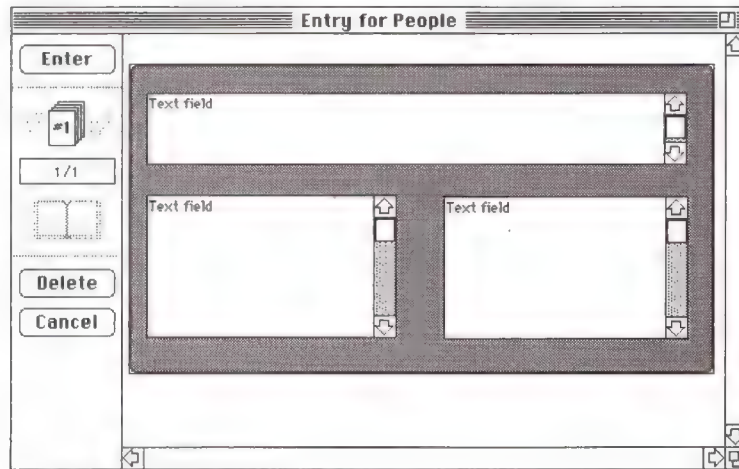


Figure 4-26
Text fields with scroll bars

You add a scroll bar by selecting the “Text with scroll bar” check box.

Whether or not a text field or enterable object has a scroll bar, the user can also scroll the information by using the arrow keys.

Creating Styles

4th DIMENSION lets you define styles so that you can quickly specify display formats and entry filters. Styles are useful when you use the same display formats and entry filters in several places. For example, if you display fields with the same entry filter in several layouts, you can create the entry filter once and specify it with the style name wherever you need it.

You create a style in the Styles dialog box. You must create a style before you can use it in the Field Definition dialog box.

To create a style, follow these steps:

1. Choose Preferences from the File menu.

4th DIMENSION displays the Preferences dialog box.

For complete information about the Preferences dialog box, see “Setting Preferences,” in Chapter 1.

2. Click the Edit Styles button.

4th DIMENSION displays the Styles dialog box, shown in Figure 4-27.

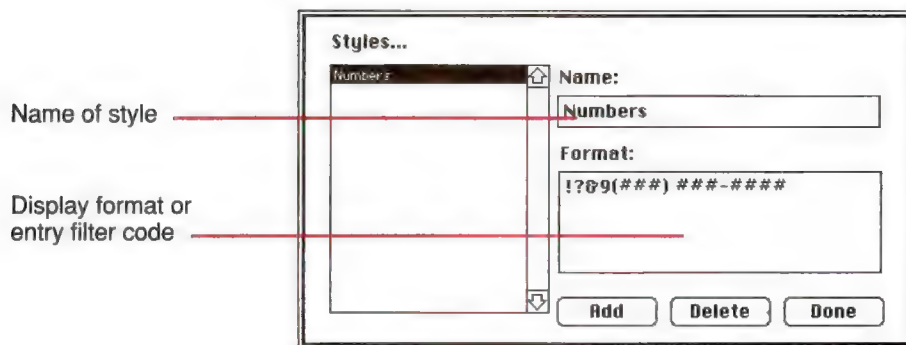


Figure 4-27
The Styles dialog box

3. Type the name of the style in the name box.

You can use any characters for the style name. You can use up to 20 characters for the style name.

For example, you would enter “Phone” in the Name box to create a style named Phone.

4. Type the display format or entry filter you want to use in the Format area.

You create a display filter or an entry filter in the Styles dialog box just as if you were typing it into the Field Definition dialog box. For information about creating display formats and entry filters, see “Field Display Formats” and “Using an Entry Filter,” earlier in this chapter.

For example, if you wanted to create a Phone entry filter, you could type

!&9(###) ###-###

5. If you want to create another style, click Add.

The style name you just created appears in the list of styles on the left.

6. When you have finished adding styles, click Done.

You can edit any style by selecting it and changing the name or the code. You can delete any style by selecting it and clicking Delete.

Using Styles

After you create a style, you can use in the Field Definition dialog box.

You enter the style name, preceded by a vertical bar, in the format display area (for display formats) or the Entry Filter box (for entry filters).

Figure 4-28 shows a style being used in the format display area and the Entry Filter box.

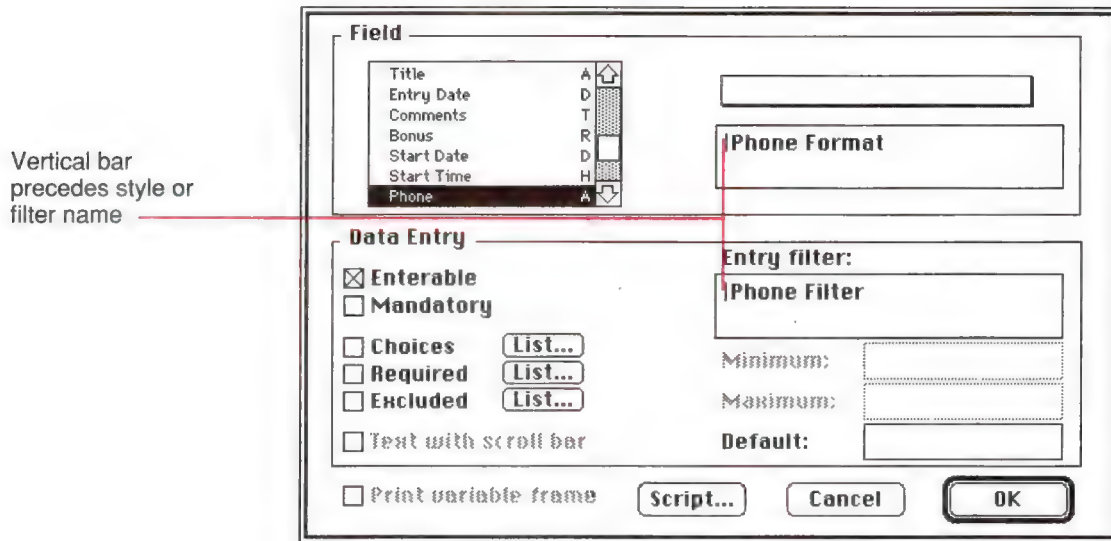


Figure 4-28
Styles used for the format and filter

Printing With Variable Frame

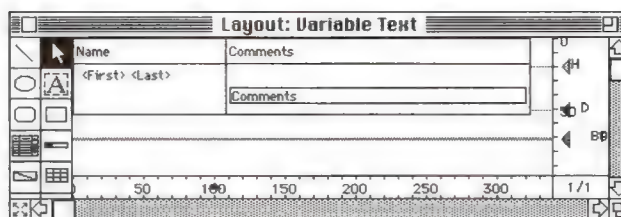
When you print Text fields, Picture fields, and enterable objects that display text, you can instruct 4th DIMENSION to print them with “variable frame” so that the entire contents of the field or object is printed.

To print with variable frame, select the “Print with Variable Frame” check box in the Field Definition dialog box. Figure 4-29 shows the check box.



Figure 4-29
The “Print variable frame” check box

If you select “Print variable frame” for a field or an object, during printing 4th DIMENSION expands the part of the layout containing the area, until the entire field entry has been printed. Figure 4-30 on the following page shows how variable frame prints such an object.



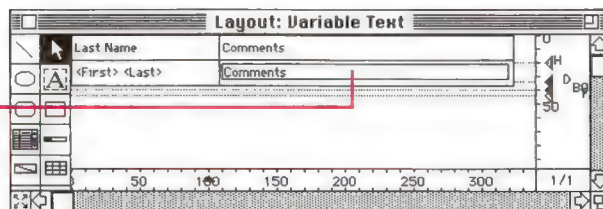
Name	Comments
Mary Fong	Mary has been a customer for three years. Her needs have changed a lot since her first purchase from us. We need to meet with her soon to find out what her buying plans are for the rest of the year.
Tom Johnson	Tom is a new customer and has just decided to switch from Consolidated. He expects to be placing orders on a monthly basis.
Jerry Jones	Jerry has been a very good customer for the last seven years. We must continue to call on him on a regular basis. Our new product might work well for him.

Figure 4-30
Layout and result of variable frame printing

If you want only what is displayed to be printed, deselect “Print variable frame” in the Field Definition dialog box.

Because 4th DIMENSION repeatedly prints horizontal slices of the layout to accomplish variable frame printing, do not enter anything next to the field or object that you do not want repeated. Place elements above or below the variable frame field or object. Figure 4-31 shows the result of placing an element next to a variable frame field.

Field to be printed
with variable frame



Printed result repeats
extra element

Name	Comments
Mary Fong	Mary has been a customer for three years. Her needs have changed a lot since her first purchase from us. We need to meet with her soon to find out what her buying plans are for the rest of the year.
Mary Fong	Her needs have changed a lot since her first purchase from us. We need to meet with her soon to find out what her buying plans are for the rest of the year.
Mary Fong	Her needs have changed a lot since her first purchase from us. We need to meet with her soon to find out what her buying plans are for the rest of the year.
Mary Fong	Her needs have changed a lot since her first purchase from us. We need to meet with her soon to find out what her buying plans are for the rest of the year.
Mary Fong	Her needs have changed a lot since her first purchase from us. We need to meet with her soon to find out what her buying plans are for the rest of the year.
Tom Johnson	Tom is a new customer and has just decided to switch from Consolidated. He expects to be placing orders on a monthly basis.
Tom Johnson	Tom is a new customer and has just decided to switch from Consolidated. He expects to be placing orders on a monthly basis.
Tom Johnson	Tom is a new customer and has just decided to switch from Consolidated. He expects to be placing orders on a monthly basis.
Jerry Jones	Jerry has been a very good customer for the last seven years. We must continue to call on him on a regular basis. Our new product might work well for him.
Jerry Jones	Jerry has been a very good customer for the last seven years. We must continue to call on him on a regular basis. Our new product might work well for him.
Jerry Jones	Jerry has been a very good customer for the last seven years. We must continue to call on him on a regular basis. Our new product might work well for him.
Jerry Jones	Jerry has been a very good customer for the last seven years. We must continue to call on him on a regular basis. Our new product might work well for him.

Figure 4-31
Elements placed next to variable frame field

Using Scripts

Each active object in a layout can have an associated script—a short series of instructions that performs an operation or calculation. Generally, scripts are used to manage the objects they are associated with. They tend to be short—one to a few lines long. If you are familiar with spreadsheets, you can think of scripts as macros.

Here are some of the things you can do with a script:

- Perform sophisticated data validation.
- Manage data in related files.
- Respond to a user clicking a control.
- Perform calculations on the contents of fields.

The following script calculates a total based on data in two other fields:

Line Total := Price * Quantity

The next script provides a total of all the preceding line totals in a report:

Grand Total := **Subtotal** (Line Total)

Here is a script to make all characters in a Name field uppercase:

Name := **Uppercase** (Name)

This script takes the value in the Annual Salary field and calculates a monthly salary value:

Monthly Salary := Annual Salary / 12

The following script concatenates values from a First Name field and a Last Name field and assigns the results to a non-enterable object named vName:

vName := First Name + " " + Last Name

→ You assign scripts from within the Layout editor. See the *4th DIMENSION Language Reference* for a discussion of the purpose and use of scripts and a description of the syntax and commands in the language. *Pages 7 & 128*

To add a script, follow these steps:

1. Create a new active object or field in the layout. Or double-click on an existing active object or field. When the Object Definition or Field Definition dialog box appears, click Script. Or, to quickly add or open a script, hold down the Option key while you click on an existing object. This action bypasses the Object Definition or Field Definition dialog box and goes directly to the default Procedure editor.

If an object or field is grouped with another object, it must be ungrouped before you can open its script.

If you are creating a new script, and if you have not set a default Procedure editor type in the Preferences dialog box, 4th DIMENSION displays the “Procedure type” dialog box, where you select the Procedure editor you want to use.

4th DIMENSION displays the Script window, as shown in Figure 4-32. It contains the Procedure editor.

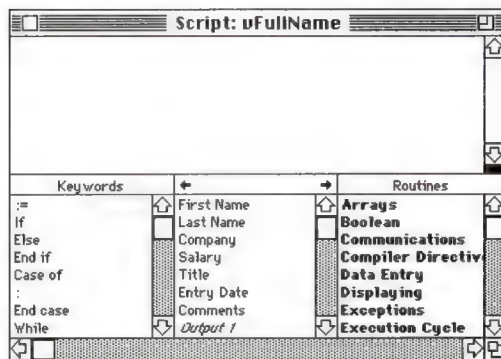


Figure 4-32
Script window

The name of the new window includes the word “Script” and the name of the object or field.

2. Write the script as you would any other 4th DIMENSION procedure.

See Chapter 6 for more information on using the Procedure editors. Also, see the *4th DIMENSION Language Reference* for descriptions of 4th DIMENSION’s language.

3. Close the Script window.

4th DIMENSION displays the layout you have been working on.

The script is now associated with the field or active object. Whenever you use the layout in the User environment or Runtime environment, 4th DIMENSION performs the operation assigned to the object.

If you associate a script with a field, the script is executed several times: before a record is displayed, each time the field is modified, when the field is printed, and after the record is accepted. For information about the effect of procedures being executed at certain times, see Chapter 5, “The Layout Execution Cycle,” in the *4th DIMENSION Language Reference*.

If you associate a script with an active object, you can select the “Only if modified” check box. Selecting “Only if modified” means that the script executes only when the object is used or modified.

Active Objects in a Layout

This section is devoted to the active objects you can use in a layout to control database and interface functions. Active objects include buttons, pop-up menus, scrollable areas, graph areas, and enterable and non-enterable areas.

This section explains how to use the Object Definition dialog box, and how to place and modify active objects. The different active object types are discussed in detail in the next section, “Types of Active Objects.”

Object Definition Dialog Box

Whenever you place an object in a layout, or modify the object specifications, you use the Object Definition dialog box. Use the Object Definition dialog box to name the object; specify its type; define its action; set any display formats, data entry controls, or keyboard shortcuts; and attach a script for the object.

The Object Definition dialog box, shown in Figure 4-33, is similar to the Field Definition dialog box.

Assign a
Keyboard
Equivalent

Name object

Choose type from
Type pop-up menu

Choose action or
format from Action
pop-up menu...

...or type in format in
format display area

Set data entry
controls

Control printing for
large text objects

Attach a script

Figure 4-33
Object Definition dialog box

Here are the settings available in the Object Definition dialog box.

- **Name box:** This box is for the object's name. The name of the object is also the name of a variable that is automatically associated with the object. A variable is a named location in memory that can be used to contain data. A script or procedure can control the object by referencing the object's name as a variable. Use the object's name to control the object with the 4th DIMENSION language.

You must provide a unique name for every object in a layout. Some types of objects have rules for names. (For example, each group of Radio buttons must begin with the same letter.) Any rules for names are explained under the heading for each type in the "Types of Active Objects" section.

For information about handling objects using the language, see the *4th DIMENSION Language Reference*.

- **Type pop-up menu:** This menu lets you specify the object type. Figure 4-34 shows the Type pop-up menu.

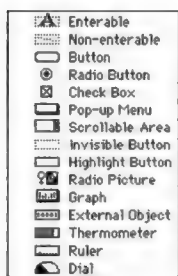


Figure 4-34
Object types in the Type pop-up menu

The object type is the key to the other parts of the dialog box. The choices available change, depending on which type you select. An enterable object can use data entry controls and display formats. A button does not use display formats or data entry controls, but can have any of 15 different actions. The object types are discussed at length in "Types of Active Objects," later in this chapter.

- **Action pop-up menu:** This menu allows you to choose a display format or action for the object. If you are using an enterable or non-enterable object, you can set the display format for the object by choosing the format from a pop-up menu. The format you choose is displayed in the Format display area, where you can edit it if necessary. For complete information about display formats, see "Field Display Formats," earlier in this chapter.

For buttons, the Format display area becomes the Button Text area, where you enter the text to display on the button. For an external area, the Format display area becomes the Procedure Name area, where you name the procedure to use in the external area. For a thermometer, ruler, or dial, the Format display area becomes the “Max; Min; Unit; Step” area, where you define the parameters for the display.

- **Key button:** You click Key to set a keyboard shortcut for a button. You can assign combinations of keys that the user can press to activate an object. The user can then activate button objects from the keyboard as well by clicking with the mouse. See “Assigning a Keyboard Shortcut,” later in this chapter, for more information.
- **Data Entry controls:** Use the data entry controls to set attributes, associate lists, establish a data entry filter, maximum or minimum values, or a default value for an enterable object. For information about data entry controls, see “Data Entry Controls,” earlier in this chapter.
- **Script button:** Use the Script button to attach a script to any active object. For information about scripts, see “Using Scripts,” earlier in this chapter.
- **Only if modified:** You use this check box to instruct 4th DIMENSION to execute the script only when the object is selected, modified, or activated in some way. If this check box is deselected, the script will be executed in the before and after phases of the execution cycle, and also while printing. For information about the execution cycle, see Chapter 5, “The Layout Execution Cycle,” in the *4th DIMENSION Language Reference*.
- **Text with scroll bar:** You select this check box to add a scroll bar to a text object. The scroll bar allows the user to scroll hidden text into view. For information about “Text with scroll bar,” see “Adding a Scroll Bar to a Text Field,” earlier in this chapter.
- **Print with variable frame:** You select this check box if you want the entire text object to be printed. For complete information about printing with a variable frame, see “Printing With Variable Frame,” earlier in this chapter.

Creating an Active Object

All objects are created in the Layout editor. When you place an object in a layout, you must name it and define its type. You can also associate a key with the object, set a display format, enter data entry controls, or add a script.

To create an active object, follow these steps:



1. In the Layout editor window, click the Create Active Object icon in the layout palette.

When you move the cursor into the layout area, it becomes a crosshair.

2. Position the crosshair where you want to place one corner of the object.
3. Drag the crosshair diagonally to define the size of the object, and then release the mouse button.

4th DIMENSION displays the Object Definition dialog box.

4. Define the object by entering a name in the Name box, and choosing a type from the Type pop-up menu.

When you choose the Type, 4th DIMENSION changes the remainder of the dialog box to suit the object type you have chosen.

5. Continue setting specifications in the Object Definition dialog box.
6. When you are finished, click OK.

The object appears in the layout where you drew it. It takes the shape appropriate to its type, and it displays the name you gave it or the text you entered for it to display.

After you create an object, you can handle it as you would any other layout object. You can resize most objects, apply a font, define a color for display on a color monitor, and so on.

Modifying an Object

You can modify the object definition of any object placed in a layout. If the object has been grouped with another object, you must ungroup it first.

To modify an object's specifications, follow these steps:

1. Select the object you want to work with, and then choose Format from the Object menu. Or double-click the object you want to work with.

4th DIMENSION displays the Object Definition dialog box for that object.

2. Make any changes you want, and then click OK.

4th DIMENSION establishes the new specifications for the object.



Display Formats for Objects

Figure 4-33 The Object Definition dialog box provides the same display formats for both enterable and non-enterable objects as it does for fields. The display format choices are available from the Action pop-up menu.

When you pull down the Action pop-up menu, you can choose a format for number, date, time or picture data. Highlighting one of the choices displays a submenu that displays the available formats. You choose the format from the submenu.

The selected format is displayed in the format display area. You can edit the format in the usual way. You type formats for Alpha objects directly into the format display area. You can use styles to set formats. For complete information about display formats, see the appropriate sections in “Field Display Formats,” earlier in this chapter.

Figure 4-35 shows the pop-up and submenu for choosing a display format for an enterable object.

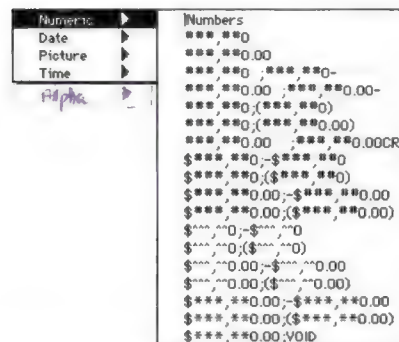


Figure 4-35
Choosing a display format for an enterable object

Data Entry Controls for Enterable Objects

The Object Definition dialog box provides the same data entry controls for enterable objects as it does for fields. There are no differences at all. You can use styles to set entry filters. For complete information, see “Data Entry Controls” earlier in this chapter.

Scripts for an Object

The Object Definition dialog box allows a script to be attached to the object. Click the Script button to attach a script. For complete information, see “Using Scripts” earlier in this chapter.

The Object Definition dialog box allows you to restrict the execution of a script by selecting “Only if modified.”

If “Only if modified” is selected, the script for the object is executed only during data entry, and then only when the object it is associated with is modified or activated.

If you deselect “Only when modified,” the script is executed according to the execution cycle. For information about the execution cycle, see Chapter 5, “The Layout Execution Cycle,” in the *4th DIMENSION Language Reference*.

Assigning a Keyboard Shortcut

The Object Definition dialog box allows you to assign a keyboard shortcut for buttons and check boxes. The user can then activate the button or select the check box by typing, instead of having to use the mouse.

To assign a keyboard shortcut, follow these steps:

- 1. Click the Key button in the Object Definition dialog box.
4th DIMENSION displays the Key dialog box, shown in Figure 4-36.

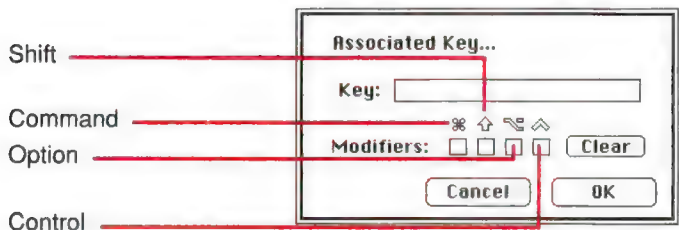


Figure 4-36
Key dialog box

- 2. While holding down any number of the Shift, Option, Command or Control keys, type the key you want to use for the shortcut.
You are not required to use the Shift, Option, Command, or Control keys. You can use any key alone as the shortcut.
- 3. When you have finished, click OK.
If you want to change the shortcut later, simply open the Key dialog box and type the combination you want to use. 4th DIMENSION displays the new combination in the Key dialog box.

Types of Active Objects

4th DIMENSION provides 15 active object types (in addition to fields):

- enterable object
- non-enterable object
- button
- radio button
- check box
- pop-up menu
- scrollable area
- invisible button
- highlight button
- radio picture
- graph
- external area
- thermometer
- ruler
- dial

The sections that follow describe each kind of object in detail.

Enterable and Non-enterable Objects

You use enterable and non-enterable objects with variables. An enterable object allows the user to enter a value into a variable and display the value. A non-enterable object allows you to display the value of a variable.

Variables are used for temporary storage of data. You manage variables using the 4th DIMENSION language. One common use for a variable is to display calculations, such as $vTotal := Quantity * Price$. Another use is as a temporary source of information. For example, you might use a variable to provide a location in which the user enters a value to search for.

Figure 4-37 on the following page shows an non-enterable object being created that displays a invoice line total.



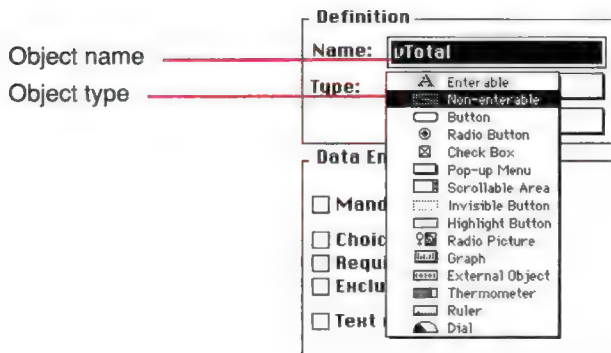


Figure 4-37
Creating a non-enterable object

An enterable object accepts data. You can set data entry controls for the object as you would for a field. The entered data is associated with the object name. You control the data with scripts or other procedures, using the object's name as a variable.

A non-enterable object displays data. The displayed data is associated with the object's name. You control the data with scripts or other procedures, using the object's name as a variable.

Enterable and non-enterable objects can be of any size. Since they display characters, when the object area is resized, it snaps to a size depending on its font size. Objects that contain alphanumeric characters, numbers, dates, times, and pictures can make use of display formats. Text objects can use a scroll bar and can be printed with variable frame.

Automatic Buttons

4th DIMENSION buttons allow you to create a custom interface with no programming. You simply place the buttons in the layout. Automatic buttons let the user accept, cancel, or delete records; move between records; move from page to page in a multi-page layout; and open, delete, or add records in an included layout.

Note that if you create one button in a layout, the standard User environment Control Panel for data entry is removed. In other words, if you create one button, you must create all the buttons you need.

Three kinds of buttons provide automatic actions:

- button
- highlight button
- invisible button

Figure 4-38 shows examples of these types of buttons.



Figure 4-38
Button, invisible button, and highlight button

Buttons are standard Macintosh buttons. They are displayed as boxes with rounded corners. Button text is displayed in the selected font, size, style, and color.

Highlight buttons are invisible until they are clicked. Then they are highlighted. The user can drag the pointer off the button to avoid activating it. Usually you place a highlight button on top of a graphic, such as an icon or picture, that indicates to the user where to click.

Invisible buttons are invisible, and perform their actions immediately when clicked. There is no indication to the user that the button has been clicked except that the action is performed. You should use highlight buttons in most cases, since highlight buttons provide notice to the user that a button is about to be activated.

Figure 4-39 shows a button being created.

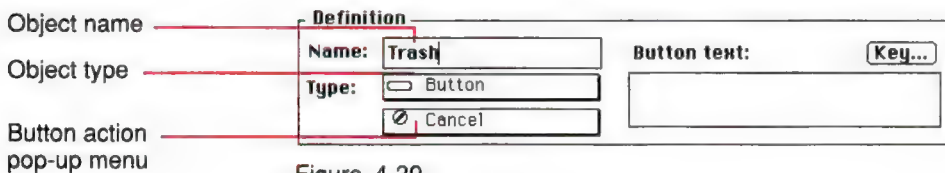


Figure 4-39
Creating a button

After you have chosen Button, Highlight Button, or Invisible Button from the Type pop-up menu, you can choose the button action you want from the Action pop-up menu. Figure 4-40 shows the Action pop-up menu.

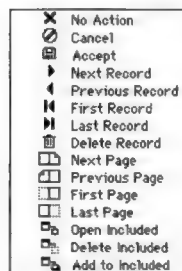


Figure 4-40
Button Actions

All variables associated with buttons, whether standard, highlight, invisible, radio, radio picture, or check box, are initialized to 0 when the layout is first opened in the User or Runtime environment. When the user clicks the button, it becomes 1. You can associate a script with any button.

Buttons are dimmed in appropriate circumstances in the User or Runtime environment. For example, when the first record is displayed, a First Record button is dimmed.

The sections that follow discuss each button action.

No Action Button

Use a No Action button for a button that does not perform an automatic action. You use a script to manage this kind of button.

Accept and Cancel Buttons

Clicking an Accept button saves a record.

Clicking a Cancel button abandons the current record without saving any changes.

Delete Record Button

Clicking a Delete Record button displays an alert asking the user to confirm the deletion. Clicking Yes in the alert deletes the current record. If the user is using the input layout for a subrecord, Delete Record deletes the current subrecord.

After the user clicks a Delete Record button, 4th DIMENSION automatically returns to the output display in the User environment.

Record Buttons

The Next Record, Previous Record, First Record, and Last Record buttons first accept the current record, and then make the specified record current. The specific record made current by these buttons depends on the sort order.

These buttons perform the appropriate actions for subrecords when the user is in entering subrecords.

A button of this type is automatically disabled when its action is inappropriate. For example, if the user displays the first record, a Previous Record button would be disabled.

Page Buttons

The First Page, Last Page, Next Page, and Previous Page buttons display the appropriate layout page. If there is only one page, these buttons are inactive.

A button of this type is automatically disabled when its action is inappropriate. For example, if the user displays the first page, a Previous Page button would be disabled.

Included Record Buttons

The Included Record buttons affect records in included layouts. You can open, delete, or add to included records. Placed on a parent record's layout, they affect subrecords in an included layout. Here are the Included Record button actions:

- **Open Included:** This button is active when a record in an included layout has been selected. If the user selects a record and clicks Open Included, the Full Page layout for that record opens, and the user can modify the record.
- **Delete Included:** This button is active when a record has been selected in an included layout. Delete Included does not display an alert, but erases the record immediately.
- **Add to Included:** This button is active when an included layout has been selected. When the user clicks an Add To Included button, 4th DIMENSION creates a new record in the included layout, scrolls to the record, and places the cursor in the first enterable field.

Check Boxes

A check box is a type of button. A check box is either selected or deselected. The effect of a check box is controlled with a script or procedure. Like all buttons, a check box is initialized to 0 when the layout is first opened. A script associated with a check box executes when the check box is selected.

Figure 4-41 shows a check box being created.

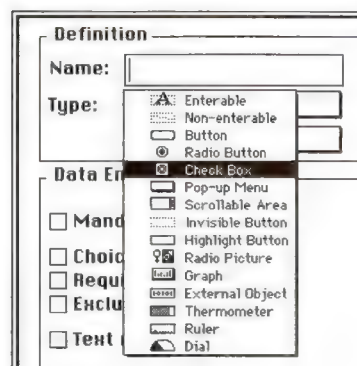


Figure 4-41
Creating a check box

A check box displays text next to a small square. When the user selects the check box, the square is checked (an “X” is placed in it). When a check box is selected, it has the value 1. When deselected, it has the value 0. Any or all check boxes in a layout can be selected or deselected. A group of check boxes allows the user to select several items.

The check box object is quite different from the check box format of a Boolean field. The information in a check box object is not stored automatically; instead, the information is available as a variable to be used elsewhere in the application. The user might use check boxes to establish printer settings, for example.

Radio Buttons and Radio Pictures

Radio buttons and radio pictures are objects that allow the user to select one of a group of buttons or pictures. Radio buttons and radio pictures work the same way; the difference between the two is strictly visual. A radio button shows a small bull’s eye and text; a radio picture displays an icon or picture.

A radio picture is like a highlight button, in that it is transparent until selected; when selected, it highlights the picture behind it. The user can move the pointer off the radio picture to avoid selecting it.

Figure 4-42 shows radio buttons and radio pictures.

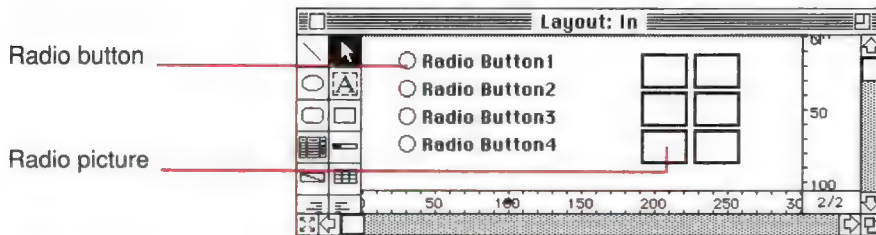


Figure 4-42
Radio buttons and radio pictures

The remainder of this section uses the term “radio button” to mean either a radio button or a radio picture.

Radio buttons exist in exclusive sets. The name of each object in a group of radio buttons must begin with the same letter (for example, bRadio1, bRadio2, bRadio3). The effects of radio buttons are controlled with scripts or procedures. Like all buttons, a radio button is initialized to 0 when the layout is first opened. (When no button is selected.) A script associated with a radio button executes when it is selected.

Figure 4-43 on the following page shows a radio button being created.

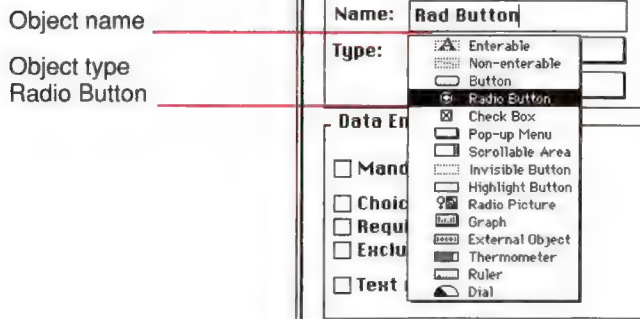


Figure 4-43
Creating a radio button

Selecting one radio button in a group sets that button to 1 and all the others in the group to 0. Only one radio button can be selected at a time.

The radio button object is quite different from the radio button format of a Boolean field. The information in a radio button object is not stored automatically; instead, the information is available as a variable to be used elsewhere in the application. The user might use radio buttons or radio pictures to choose which serial port to use, for example.

Pop-up Menus and Scrollable Areas

Pop-up menus and scrollable areas are objects that allow the user to select from a list called an array. An array is a table in memory that is referenced by the name of the array. A pop-up menu displays the array as a standard Macintosh pop-up menu. A scrollable area displays the array in a list that can be scrolled and used to select an item.

Figure 4-44 shows a scrollable area and a pop-up menu.

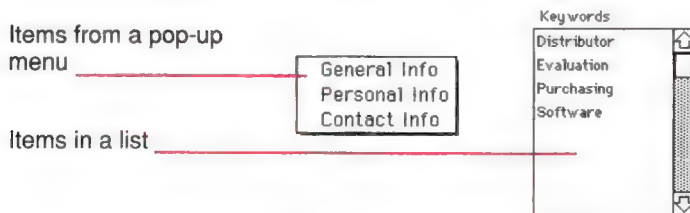


Figure 4-44
Pop-up menu and a scrollable area

When the user selects an item from an array, any script associated with the array is executed. Typically, the value selected is moved to some other place and saved, or used to control another procedure.

Arrays always contain a finite number of items. The list of items is dynamic, and can be changed by a procedure. Items in an array can be modified, sorted, and added to.

Filling an array (entering the items into the array) is always performed with the language. An array can be filled from a list, or from a selection of records or subrecords, or it can be specified directly with the language.

For information about ways to create and use an array, see Chapter 9, “Arrays and Pointers,” in the *4th DIMENSION Language Reference*.

Graph Areas

A graph area can be used to display a graph in a layout. There are many ways to bring values to the graph area for calculation and display, all of which are controlled by the graphing commands in the language. The subject is covered in the “Graphing” section of Chapter 13 in the *4th DIMENSION Language Reference*.

External Areas

An external area is completely controlled by an external procedure. External procedures are small routines, typically written in Pascal or C, that you install in a 4th DIMENSION database.

You reference the external program by entering the procedure name in the Procedure Name area, as shown in Figure 4-45.

Procedure name:

Calendar

Figure 4-45
Entering a procedure name

External areas extend the capabilities of 4th DIMENSION to include custom actions such as word processing.

You install external routines in a 4th DIMENSION database by using the 4th DIMENSION External Mover utility. For complete information about installing external programs into a database, see the *4th DIMENSION Utilities Guide*.

Thermometers, Rulers, and Dials

Thermometers, rulers, and dials are objects that can display a value. They indicate a value graphically. The three objects work in the same way; they differ only in their appearance.

You can use thermometers, rulers, and dials either to display values or to set values. If a thermometer, for example, is given a value by a script, it

shows the value given. If the user drags the indicator point, the value changes. The value can be used in another object (a field or an enterable or non-enterable object). Figure 4-46 shows these indicators, and how they may be related to a field.

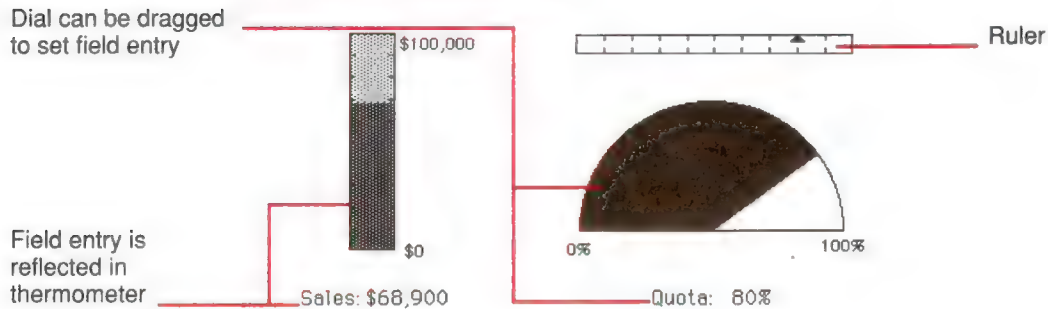


Figure 4-46
A thermometer, a ruler, and a dial

You use the Object Definition dialog box to establish the scale for each of these objects. You set the minimum value, the maximum value, the units for the tick marks on the scale, and the minimum steps that the indicator will allow. For example, if you enter

0;100;10;5

the object would set the minimum to 0, the maximum to 100, place tick marks every 10 units on the indicator, and would allow increments of 5. Figure 4-47 shows these values being set for a thermometer.

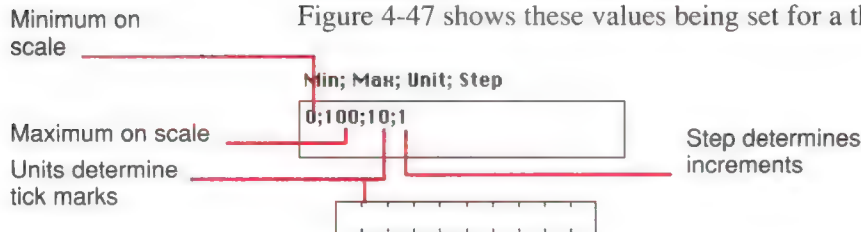


Figure 4-47
Scale and indicator settings

To establish the settings for the minimum, maximum, units, and step, type the values you want 4th DIMENSION to use in the display area. Separate the values with a semicolon. The settings are accepted only if all four are entered. If you want to label the indicator, use a text area in the layout to do so.

You place values into, or use values from, the thermometer, ruler, or dial by means of scripts. For further information, see Chapter 4, "Layouts and Scripts," in the *4th DIMENSION Language Reference*.

Objects on Grid

Sometimes you may want to place several similar active objects in a layout at the same time, numbering them sequentially so that their names are unique. For example, you may want to create a series of buttons that perform database operations, as shown in Figure 4-48.

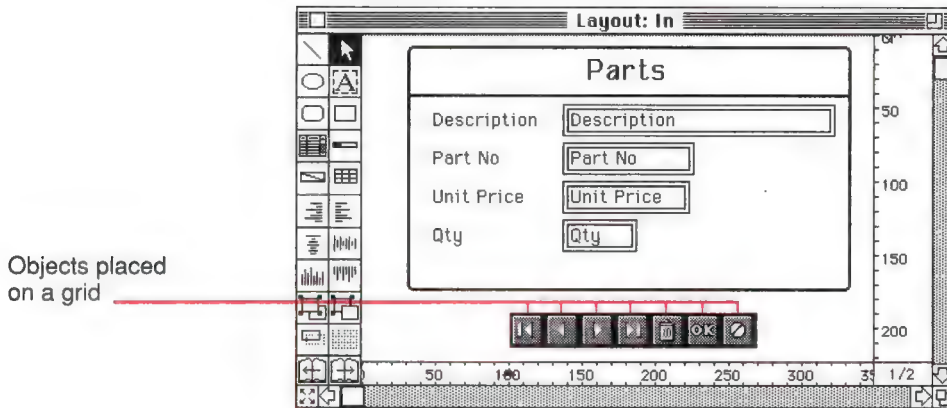


Figure 4-48
Objects on a grid

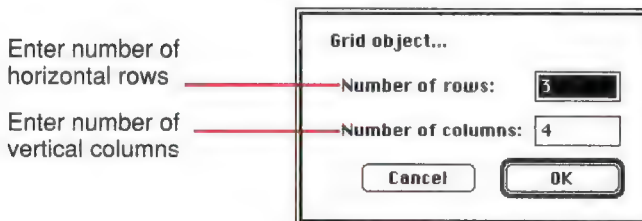
The Layout Grid tool and the Objects on Grid command work together to provide a quick and easy way to place objects on a grid.

To create an array of active objects, follow these steps:



1. Select the Layout Grid tool, and draw a rectangle big enough to contain the objects you want to place in the layout.

4th DIMENSION displays the “Grid object” dialog box, as shown in Figure 4-49.



Grid object with three rows and four columns



Figure 4-49
“Grid object” dialog box

2. Enter the number of rows and columns you want in the grid, and click OK.

4th DIMENSION creates a grid with the specified number of rows and columns. The grid is a graphic object that uses the current line width, fill pattern, and border pattern.

3. Resize the grid, if necessary, making each cell in the grid a little larger than the size of the object you want to display.

Resizing an object is described in Chapter 3.

4. Create a new active object of the size and type you require, and position it in the upper-left cell in the grid object.

Give the new object a name without a number at the end.

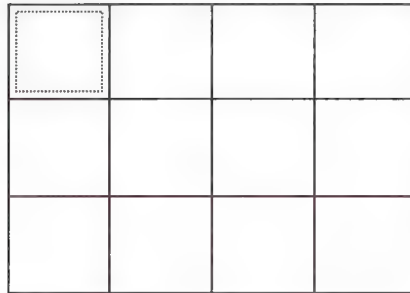


Figure 4-50
An active object in first cell of a grid

5. Select both the grid and the active object.
6. Choose Objects on Grid from the Layout menu.

4th DIMENSION copies the active object to each cell in the grid, giving each active object a unique number.

4th DIMENSION numbers the active objects from top to bottom in each column. These numbers are added to the object name for each object, thus creating a unique object at every grid cell.



Note: To number the series of active objects from left to right in each row, hold down the Option key when you choose Objects on Grid.

You can now use the language to reference these objects by the names they have been given. You can delete the grid or leave it in the layout.

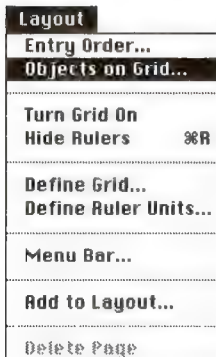


Figure 4-51 shows the objects created and placed on the grid.

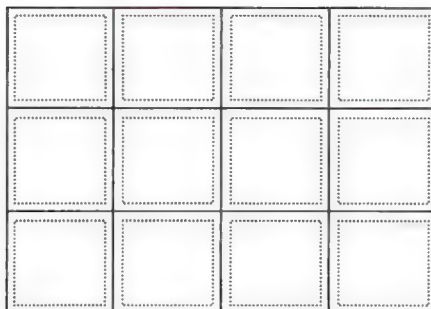


Figure 4-51
Active objects on the grid

Using Included Layouts

You can display and print a layout from one file or subfile in an input layout from another file. Such layouts are called included layouts. Included layouts appear as small “output” layouts during data entry. You can use an included layout to do several tasks:

- Display records from subfiles or from other files.
- Enter data into subrecords or records in other files.
- Print subrecords or records from other files.
- Branch to the input layout of a subfile or other file.

Figure 4-52 shows included layouts from a subfile and a related Many file.

Subfile layout included in parent file layout

Layout included from related file

Companies		
Name	Acme	A/C Phone
Address	123 Some St.	213 555-1234
State	NY	714 555-7681
		415 555-8907

First	Last	Salary
Peter	Petrie	50700
Carol	Booker	22500
Eric	Warnock	74000

Figure 4-52
Included layouts

An included layout is usually a layout associated with a subfile or a related Many file. However, an included layout can be from any file in the database.

Included layouts can appear in input layouts only. They can be printed, however, when the layout is used for printing.

You can create included layouts automatically when you create a new layout, or you can add the included layout to an existing layout in the Layout editor. If you add the layout through the Layout editor, you must have first created the layout you want to include.

Creating an included layout automatically is described in “Selecting Fields for the Layout,” in Chapter 3. See especially the section titled “Using Included Layouts for Files and Subfiles.”

Entering Data in an Included Layout

Included layouts can be used for data entry in two ways. The user can enter data directly in the included layout, or the user can enter it in an input layout. Figure 4-53 shows both an included layout and an input layout associated with it.

Included layout

All Coast Tool Co.
123 Main St.
Anytown, USA

Invoice

Invoice Number

Customer Date

Terms

Quantity	Part	Description	Price
10	145-854	Locking Bit	\$75
100	187-992	Small Tap	\$45
45	232-752	Zinc coated strap iron	\$125
36	121-365	Hex Nut and washers	\$25

Thank You for your business

Invoice Total: **\$2,302**

Input layout

Items

Part Number

Quantity

Description

Price

Invoice Number

Figure 4-53
Included layout and input layout

The layout used as the included layout is referred to as the multi-line layout. The input layout is referred to as the full page layout.

You can allow the user to enter data through the multi-line layout, and you can allow the user to double-click the multi-line layout to display the full page layout. Figure 4-54 shows the Included Layout dialog box being used to establish these options.

Multi-line layout will be displayed in included layout area

Full Page layout will serve as input layout

Enterable to allow data entry in multi-line layout

"Double clickable" allows full page layout to be used

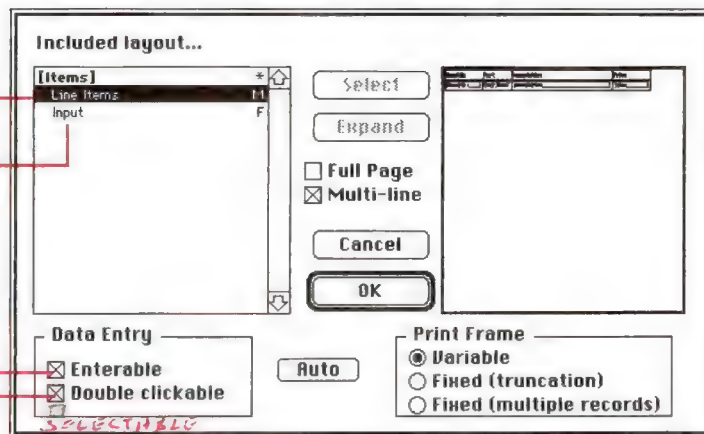


Figure 4-54
Setting data entry options for included layouts

Normally, an output layout is better suited for multi-line display and an input layout is better suited for full-page display. If you do not specify a full page layout, 4th DIMENSION automatically uses the default input layout for that file.

Occasionally, you will want to prevent a user from using an included layout for data entry. You can prevent data entry in an included layout by deselecting the Enterable check box. And you can prevent the display of the full page layout by deselecting the "Double clickable" check box.

You can add custom buttons to a layout to control records in an included layout. These buttons are Open Included, Delete Included, and Add To Included. For information about adding these buttons, see "Automatic Buttons," earlier in this chapter.

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See "Entering Data in Included Layouts" in the *4th DIMENSION User Reference* for complete information on how to enter data into included layouts in the User environment.

Displaying Data in an Included Layout

An included layout typically displays several records associated with the record in whose layout it appears. For displaying records, you usually select an output layout. 4th DIMENSION calls the layout that is used to display records in an included layout the multi-line layout. Figure 4-55 shows a multi-line layout in an included layout area.

Included layout area

Multi-line display

Invoices				
Invoice Number	1001			
Customer	Smith Tool Co.			
Date	6/22/89			
Terms	Net 30			
Quantity	Part	Description	Price	
10	145-854	Locking Bit	75.23	
100	187-992	Small Tap	45.32	
45	232-752	#10 Zinc Strip	125.99	

Figure 4-55
Multi-line layout displays several records

You can adjust the included layout area as necessary to display the records. The wider you make the area, the more columns can be displayed. The taller you make the area, the more records can be displayed. An included layout area automatically displays a scroll bar so that the user can scroll through the records or subrecords.

When you create the included layout, you can tell 4th DIMENSION to automatically resize the included layout area to display all the columns in the multi-line layout. See “Creating an Included Layout,” later in this chapter.

Printing Data in an Included Layout

You usually use an output layout to print records in an included layout. Because there may be more records than can fit in the included layout area, 4th DIMENSION provides three options for controlling how records are printed:

- Variable frame. 4th DIMENSION expands or contracts the included layout area to print all the records. This option is similar to “Print with variable frame” for text fields.
- Fixed frame (truncation). 4th DIMENSION prints the records that fit into the area of the included layout. The layout is printed only once, and those records that are not printed are ignored.
- Fixed frame (multiple records). 4th DIMENSION prints the records that fit into the area of the included layout, but prints the layout several times to accommodate all the records.

Figures 4-56a, 4-56b, and 4-56c show the results of each of these options.

Invoices				
Invoice Number	1001			
Customer	Smith Tool Co.			
Date	6/22/89			
Terms	Net 30			
Quantity	Part	Description	Price	
10	145-854	Locking Bit	75.23	
100	187-992	Small Tap	45.32	
45	232-752	#10 Zinc Strip	125.99	
36	121-365	Hex Nut	25.36	
250	369-214	Lock Washer	37.52	
75	435-878	Ring Keeper	289.89	

Figure 4-56a
Variable frame print option for included layout

Invoices				
Invoice Number	1001			
Customer	Smith Tool Co.			
Date	6/22/89			
Terms	Net 30			
Quantity	Part	Description	Price	
10	145-854	Locking Bit	75.23	
100	187-992	Small Tap	45.32	
45	232-752	#10 Zinc Strip	125.99	
36	121-365	Hex Nut	25.36	

Figure 4-56b
Fixed frame (truncation) print option for included layout

Invoices				
Invoice Number	1001			
Customer	Smith Tool Co.			
Date	6/22/89			
Terms	Net 30			
Quantity	Part	Description	Price	
10	145-854	Locking Bit	75.23	
100	187-992	Small Tap	45.32	
45	232-752	#10 Zinc Strip	125.99	
36	121-365	Hex Nut	25.36	

Invoices				
Invoice Number	1001			
Customer	Smith Tool Co.			
Date	6/22/89			
Terms	Net 30			
Quantity	Part	Description	Price	
250	369-214	Lock Washer	37.52	
75	435-878	Ring Keeper	289.89	

Figure 4-56c
Fixed frame (multiple records) print option for included layout

Printer control markers also affect how records are displayed in an included layout, and how those records are printed. See “Using Control Lines,” in Chapter 5, for more information.

Creating an Included Layout

You create an included layout by adding an included layout area to a layout.

To create an included layout, follow these steps:



1. Click the Included Layout Area icon on the layout palette.

When you move the cursor into the layout area, it becomes a crosshair.

2. Position the crosshair where you want to place the upper-left corner of the included layout area.
3. Drag the crosshair diagonally to define the size of the included layout area, and then release the mouse button.

4th DIMENSION displays the Included Layout dialog box, as shown in Figure 4-57.

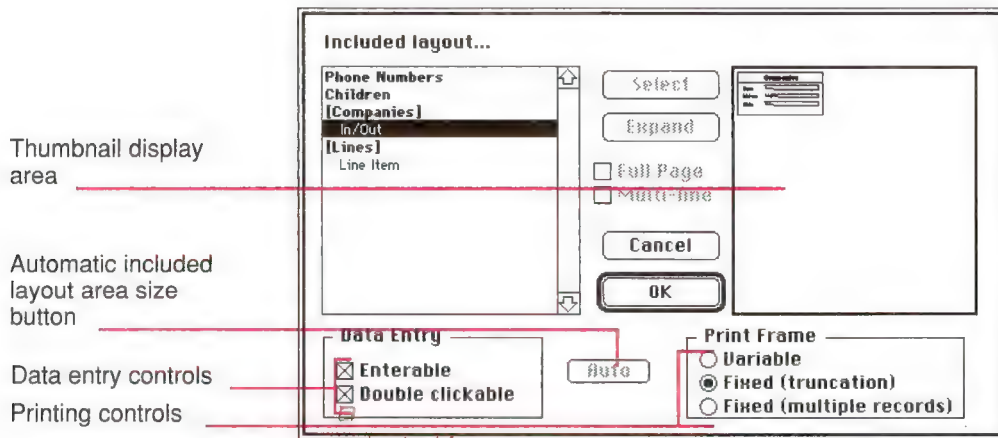


Figure 4-57
Included Layout dialog box

In this dialog box, you select both the file and the layout you want to include. You must first select a file for the included layout.

4. Select the file or subfile from which you will include a layout, and then click Select.

4th DIMENSION places an asterisk next to the selected filename. The asterisk indicates that this file is the file for the included layout.

Your next step is to select the layout you want to use from the file you have selected.

5. Click Expand to see the names of all the layouts associated with the file or subfile you have selected. Or double-click the filename or subfile name to expand the list of layouts.

Figure 4-58 shows the list of files and subfiles expanded to show layout names.

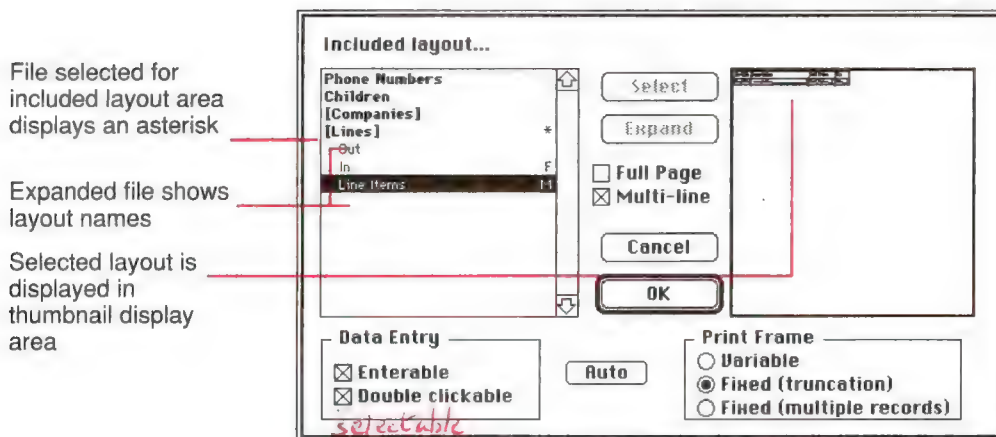


Figure 4-58
Expanded list of layouts

6. Select the name of the layout you want to use to display records in the included layout area.

The layout you select is displayed in the thumbnail display area so that you can be sure it is the layout you want.

7. Click the Multi-line check box.

4th DIMENSION uses the multi-line layout to display records from the selected file or subfile in the included layout area. Usually, you choose an output layout that displays several records at the same time.

If you do not specify one layout as multi-line, 4th DIMENSION automatically uses the default output layout for the included layout area.

8. Select the name of the layout you want to use as a full-screen display for data entry, and then click Full Page.

You can specify the same layout as both Multi-line and Full Page, or you can leave Full Page unselected and let 4th DIMENSION automatically select the default input layout for full-page display.

9. If necessary, select a Print Frame option.
10. Use Enterable and/or "Double clickable" to specify the kind of data entry you want to have available for the included layout.

If you deselect Enterable, the user cannot enter data into the multi-line layout.

If you deselect “Double clickable,” the user cannot display or use the full page layout.

11. If you want 4th DIMENSION to automatically set the horizontal size of the included layout area to display all the fields, click Auto.

If you do not click Auto, the multi-line layout will be displayed in the area you have drawn. If the area is too small, fields to the right will be invisible.

12. Click OK.

4th DIMENSION returns you to the current layout. The name of the file or subfile you selected in the Included Layout dialog box is displayed in the included layout area.



Note: You will often want to place a frame around the included layout. Do so by selecting the area and pressing Command-1. 4th DIMENSION displays a rectangle around the area using the default line width and border pattern.

Modifying an Included Layout

To modify an included layout, follow these steps:

1. Double-click the included layout area in the layout. Or select the included layout area, and then choose Format from the Object menu.

4th DIMENSION displays the Included Layout dialog box.

2. In the Included Layout dialog box, make any changes you want for the included layout.

You can specify a different full page or multi-line layout, change the data entry specifications, or make changes to the way the frame is printed.

Using Layout Menus

You can associate custom menus with a layout. A custom menu associated with a layout is added to the menu bar in the User and Runtime environments when that layout is used. Custom menus contain menu items that activate procedures. 4th DIMENSION procedures can perform many complex operations automatically.

One common use of layout menus is to let the user control data entry with menu commands instead of buttons. You can create menu commands that perform the OK, Cancel, Next Record, Previous Record, Next Page, and Previous Page commands, and so on.

You use the Menu editor to create custom menu bars. Each menu bar contains one or more menus. Each menu bar you create has a number. You use the menu bar number to associate the menu bar with a layout. For complete information about creating menu bars, menus, and menu items, see Chapter 7, “Creating Custom Menus.”

In the User environment, a layout menu bar is appended to the right of the User environment menu bar. A layout menu bar is displayed only when the layout is used for input.

In the Runtime environment, a layout menu bar is appended to the right of whatever menu bar is current. The appended layout menu bar disables the other menus on the menu bar, unless you precede the layout menu bar specification with a minus sign. If a layout menu bar is the same as the current menu bar, it is not appended. (The user would not get two sets of the same menus.) A layout menu works in both input and output layouts.

For more information about menus, see “A Custom Menu Example,” in Chapter 7 of the *4th DIMENSION Language Reference*.

To associate a menu bar with a layout, follow these steps:

1. Open the layout to which you want to associate a menu bar.
2. Choose Menu Bar from the Layout menu.

4th DIMENSION displays the “Associate with menu bar #” dialog box, shown in Figure 4-59.

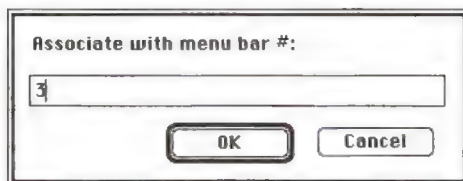


Figure 4-59
Associating a menu bar with a layout

3. Type the number of the menu bar you want to associate with the layout, and then click OK.

Subsequently, when this layout is displayed in the User or Runtime environment, the menus on the menu bar you have associated with it are appended to the right of the current menu bar.

If you are associating a menu bar with a layout for use in the Runtime environment, precede the menu bar number with a minus sign. The minus sign instructs 4th DIMENSION to keep the current menu bar commands active. In the absence of the minus sign, a layout menu bar disables whatever menu bar is current, leaving only the layout menu bar active.

Figure 4-60 shows layout menus displayed to the right of standard User environment menus.

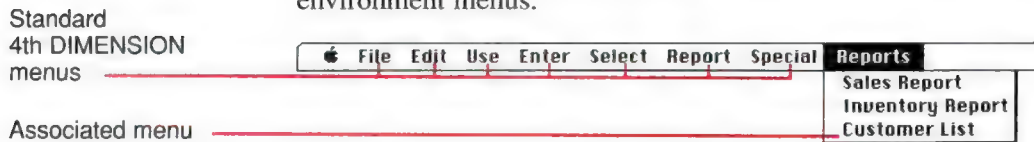


Figure 4-60
Layout menu displayed on the right



CREATING LAYOUTS FOR OUTPUT DISPLAY AND REPORTS

Quick Reports:
User Guide Ch 8

4th Dim Printing SAS

using another application

! (export data : zeros ~~0~~ in empty N2 fields ^{shown} *

= (quick report : N2 field shows empty when zeros. ✓

// | export file can be named from within a procedure. ✓

(quick report → file i.e. Disk file
File Name to be entered manually. *

CREATING LAYOUTS FOR OUTPUT DISPLAY AND REPORTS

4th DIMENSION layouts can be designed specifically for displaying records and for printing reports. This chapter explains how the output control lines in the Layout editor affect screen display and printed reports.

This chapter explains

- how to move the output control lines on the layout
- where to place fields to display and print data from each record
- where to place elements to be displayed or printed in a header
- where to place elements to be printed in a footer
- how the sort order affects reports
- how to create additional breaks
- how to create break headers
- how to use scripts for time, date, and page number
- how to create totals, subtotals, and other summary calculations

Output Layouts

Output layouts are used to display records on screen, and to print reports. Any layout can be used as an output layout, but the most common output layout displays a list of records.

The Layout editor allows you to create Header, Detail, Break, and Footer areas for an output layout. You can use these areas to display and print information in addition to the records themselves.

In a layout used for screen display, a Header area can contain column labels that identify the information in each field. The Detail area is where the records themselves are displayed. Figure 5-1 identifies the different areas as they appear on screen.

Header area

Detail area

First Name	Last Name	Depart	Salary
Tom	Johnson	DES	\$26,500
Alice	Bentley	TRAN	\$28,000
Biff	Davis	SAL	\$43,780
Shirley	Ransome	MAN	\$36,040
Dennis	Hanson	ADM	\$40,520
Lydia	Vernon	SAL	\$36,870
Andy	Venable	ART	\$43,520
Jim	Borrell	SAL	\$36,540
Bryan	Pfaff	ADM	\$26,440
Nancy	Heizer	SAL	\$26,270
Kathy	Forbes	ART	\$18,840
Garth	Hammons	SAL	\$50,100
Mary	Smith	ADM	\$26,500
Frederic	Bell	MAN	\$25,200
John	Martin	ARTAI	\$56,144
Shirley	Nalevanko	DES	\$41,050
Marlys	Wilson	ADM	\$36,500
George	Lyle	SAL	\$47,900

Figure 5-1
An output layout in the User environment

These areas work slightly differently in the User and Runtime environments. See “Using Layouts for Screen Display,” later in this chapter.

In a report, a Header area often contains the date, the time, and a running title as well as column labels. Records appear in the Detail area. A calculated total appears in the Break area. And the Footer area often contains the page number. Figure 5-2 identifies the different areas as they appear in a report.

Header area

Detail area

Break area

Footer area

Name	Title	Salary
Bentley, Alice	Engineer	\$28,000
Borrell, Jim	Salesperson	\$36,540
Davis, Biff	Salesperson	\$43,780
Forbes, Kathy	Secretary	\$18,840
Heizer, Nancy	Clerk	\$26,270
Pfaff, Bryan	Secretary	\$26,440
Ransome, Shirley	Supervisor	\$36,040
Venable, Andy	Engineer	\$43,520
Vernon, Lydia	Supervisor	\$36,870
Total Salaries for Company		\$296,300

Salary Report

Page: 1

Figure 5-2
A printed report

A report may have additional Break areas for subtotals and other calculations. And a report may have additional Header areas that appear within the body of the report. These additional areas are discussed in “Parts of a Report,” later in this chapter.

Output Control Lines

You establish Header, Detail, Break, and Footer areas by using the output control lines in the Layout editor.

Each layout starts with four control lines. The control lines define areas on the layout. You can move the control lines to allow more or less area for each one. Any object that you place in these areas is displayed or printed at the appropriate location.

Figure 5-3 shows how the output control lines in the Layout editor mark the lower boundaries of the Header, Detail, Break, and Footer areas on the layout.

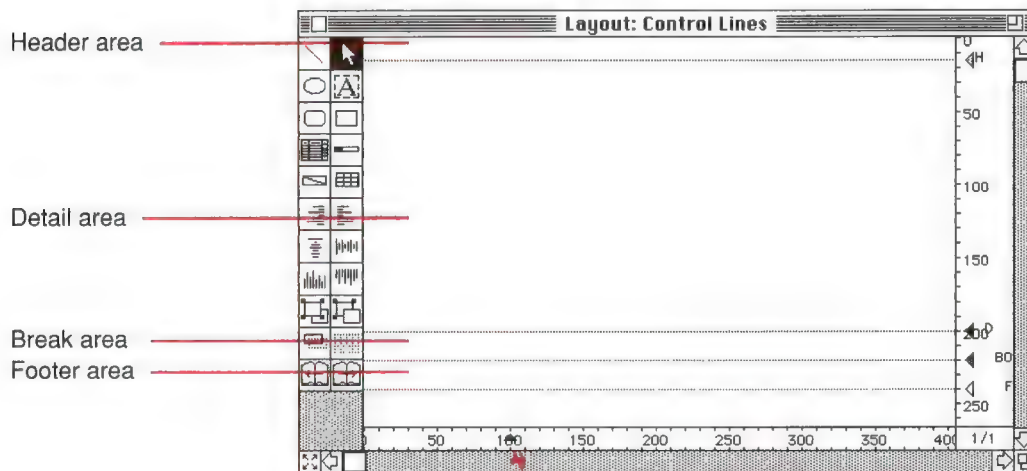


Figure 5-3
Control lines define areas

Here is how these areas work when the layout is displayed or printed:

- **Header area:** The Header area is displayed at the top of each screen in the User and Runtime environments and is printed at the top of each page of a report.
- **Detail area:** The Detail area is displayed on the screen once for each record in the User and Runtime environments and is printed once for each record in a report.
- **Break area:** The Break area is displayed once at the end of the list of records on the screen in the User and Runtime environments and is

printed once after the records have been printed in a report.

- **Footer area:** The Footer area is displayed once at the end of the list of records (following the Break area) in the Runtime environment and is printed at the bottom of every page of a report.

Whenever a layout is used for output, either for screen display or printing, the output control lines take effect, and the areas display or print at designated locations. The output control lines also take effect when a layout is used as the multi-line layout in an included layout area.

The output control lines have no effect in a layout used for input.

Scripts that are associated with objects in these areas are executed when the areas are printed or displayed. For example, if you place in the header a script to print the time, it is executed each time the header is printed.

You can create additional control lines to define additional Break areas and Header areas for a report. These additional areas allow you to print subtotals and other calculations in a report, and to display other information effectively.

Working with the output control lines and the areas they define are described in detail in subsequent sections of this chapter.

Moving Output Control Lines

A control line can be moved so its area is precisely defined.

Output control lines are displayed as lines across each layout. Each control line has an identifying marker and label that is displayed in the ruler. The control marker is the triangle in the ruler, and the label is the letter or letters next to the marker.

Figure 5-4 identifies control markers and labels.



Figure 5-4
Control markers and labels

In order to move a control line, the ruler must be displayed.

To move a control line, drag the control marker or the marker label.

Holding down the **Shift** key while dragging a control marker moves all control lines below that control marker.



For example, to drag all control lines together, hold down Shift and drag the Header marker. To move all lines except the Header line, Shift-drag the Detail marker.

The control lines cannot be dragged out of order. For example, if you attempt to drag a Footer control line higher than a Break control line, the drag operation automatically stops when the Footer marker reaches the Break marker.

You can place markers and lines on top of one another. Placing one marker on top of another reduces its area to nothing, effectively disabling its operation. For example, if you have nothing to print in a Footer area, you can drag the Break marker on top of the Footer marker. Doing so prevents 4th DIMENSION from allowing space for a Footer. The report can thus utilize all the space available on the page.

Similarly, if you have nothing to print or display in a Break area, you can place the Detail marker on top of the Break marker (B0), reducing the Break area to nothing. If you want to print no Details, drag the Detail marker on top of the Header marker. If you want no Header, drag the Header marker to the very top of the layout (at point 0).

Using Layouts for Screen Display

When you use a layout for screen display, the Header, Detail, Break, and Footer areas display in specific locations on the screen, and in relation to the records.

You can place an active object in the Header and Detail areas on the layout, and write an appropriate script to control it. Be sure to deselect the “Only if modified” check box in its Object Definition dialog box. See “Scripts for an Object,” in Chapter 4, for information about “Only if modified.”

In the User environment, the Header area is displayed at the top of each screen or included area. The Detail area takes up the remainder of the screen or included area. One Break area is displayed at the end of the list. The other control lines have no effect.

Figure 5-5 shows how an output layout displays Header, Detail, and Break areas in the User environment.

Saved to Disk
"Design Manual 2014"



B0

Header area
displays at top

Detail area
displays records

Break generated at
end of list

Employees: 60 of 60			
First Name	Last Name	Depart	Salary
Tom	Johnson	DES	\$26,500
Alice	Bentley	TRAN	\$28,000
Biff	Davis	SAL	\$43,780
Shirley	Ransome	MAN	\$36,040
Dennis	Hanson	ADM	\$40,520
Lydia	Vernon	SAL	\$36,870
Andy	Venable	ART	\$43,520
Jim	Borrell	SAL	\$36,540
Bryan	Pfaff	ADM	\$26,440
Nancy	Heizer	SAL	\$26,270
Kathy	Forbes	ART	\$18,840
Garth	Hammons	SAL	\$50,100
Mary	Smith	ADM	\$26,500
Frederic	Bell	MAN	\$25,200
John	Martin	ARTAI	\$56,144
Shirley	Nalevanko	DES	\$41,050
This is the Break area			

*Data from
Tutorial
"Personnel 9f"*

Figure 5-5
Output layout screen display in User environment

extra area

In the Runtime environment 4th DIMENSION displays, in addition to the Header, Detail, and Break areas, a Footer area containing any custom buttons. The custom buttons in the Footer area are displayed below the Break area, as shown in Figure 5-6.

Custom buttons
displayed in
footer area

Custom			
First Name	Last Name	Depart	Salary
Tom	Johnson	DES	\$26,500
Alice	Bentley	TRAN	\$28,000
Biff	Davis	SAL	\$43,780
Shirley	Ransome	MAN	\$36,040
Dennis	Hanson	ADM	\$40,520
Lydia	Vernon	SAL	\$36,870
Andy	Venable	ART	\$43,520
Jim	Borrell	SAL	\$36,540
Bryan	Pfaff	ADM	\$26,440
Nancy	Heizer	SAL	\$26,270
Kathy	Forbes	ART	\$18,840
Garth	Hammons	SAL	\$50,100
Mary	Smith	ADM	\$26,500
Frederic	Bell	MAN	\$25,200
This is the Break area			
<input type="button" value="Delete"/> <input type="button" value="Search"/> <input type="button" value="OK"/>			

Figure 5-6
Output layout screen display in Runtime environment

Report Designs

A report is a printed version of a database's data in records, along with explanatory and calculated information, designed to be easily read and understood. Reports are often standardized, so that the same format is used regularly; the reader can then scan the report for exceptions or unusual changes in the data.

A 4th DIMENSION report can use information from any file. Scripts and procedures can perform operations using 4th DIMENSION's advanced procedural language.

Quick Report

4th DIMENSION provides the Quick Report editor in the User environment for designing and printing most reports. You should use a layout to create a report only when you need the Layout editor's control over graphic elements, when you use procedures to manage the report, or when you need a noncolumnar report.

This section describes several report designs, and explains how the sort order affects reports.

Columnar Reports

In its simplest version, a columnar report is a table containing all the data from the records in a file. Field values are printed in columns, and each record is represented by a row. In the absence of any calculations, this kind of report prints only the Details from each record in the selection.

Figure 5-7 shows a simple columnar report.

Field names are
column Headers

Each row is a
record

Customer	Product	Date	Price
Acme Data Corp	ATN 700	1/27/88	\$12,780.00
Acme Data Corp	STS 2000	6/22/88	\$36,425.00
American Data	ATN 700	9/14/88	\$12,450.00
American Data	STS 1000	3/17/88	\$22,450.00
American Data	STS Service	4/17/88	\$3,300.00
American Data	Training Class	6/3/88	\$4,500.00
Conner Systems	ATN 700	7/22/88	\$13,560.00
Conner Systems	STS 4000	8/19/88	\$91,250.00
DataMatic	ATN 850	11/12/88	\$19,252.00
DataMatic	STS 2000	12/10/88	\$37,425.00
DataMatic	STS 4000	5/5/88	\$86,425.00
DP Network	STS 1000	2/20/88	\$21,680.00
DP Network	STS 3000	6/14/88	\$73,640.00
Omni Data Service	ATN 850	1/30/88	\$20,980.00
Omni Data Service	STS 1000	2/14/88	\$24,360.00
Omni Data Service	STS 2000	9/25/88	\$47,250.00
Omni Data Service	STS 3000	4/25/88	\$71,025.00
Omni Data Service	STS 3000	10/1/88	\$55,230.00
Omni Data Service	STS 4000	7/14/88	\$95,420.00
Omni Data Service	Training Class	2/5/88	\$4,500.00

Figure 5-7
A columnar report

Columnar reports are easy for the reader to understand. The data is conveniently arranged in tabular form. Usually, the records have been sorted into a useful order so that they fall into natural and comprehensible groupings. In the case of the records in Figure 5-7, the Sales records have been sorted by customer and product. As the reader reads down the report, the data reflects the sales to different customers. And for each customer, the product sold by the company is reported on.

Such a report is useful chiefly as a printed version of the data, a copy of the information in the records.

Summary Information in Reports

4th DIMENSION can automatically calculate totals and subtotals and print these summaries in convenient places. Figure 5-8 shows a columnar report that includes subtotals for each customer and a total at the end of the report.

Sort level 1: Customer

Customer	Product	Date	Price
American Data	ATN 700	9/14/88	\$12,450
American Data	STS 1000	3/17/88	\$22,450
American Data	STS Service	4/17/88	\$3,300
American Data	Training Class	6/3/88	\$4,500

Sort level 2: Product

Subtotal			\$42,700
Horizon Services	ATN 850	10/18/88	\$25,364
Horizon Services	STS 1000	11/17/88	\$24,123
Horizon Services	STS 3000	5/7/88	\$74,250
Subtotal			\$123,737
James Research	ATN 500	6/22/88	\$8,900
Subtotal			\$8,900
Omni Data Service	ATN 850	1/30/88	\$20,980
Omni Data Service	ATN 850	10/5/88	\$7,900
Omni Data Service	STS 1000	2/14/88	\$24,360
Omni Data Service	STS 3000	6/22/88	\$53,252
Omni Data Service	STS 3000	4/25/88	\$71,025
Omni Data Service	STS 3000	10/1/88	\$55,230
Omni Data Service	STS 3000	9/25/88	\$47,250
Omni Data Service	STS 4000	7/14/88	\$95,420
Omni Data Service	STS 4000	8/3/88	\$89,740
Omni Data Service	STS 4000	5/17/88	\$92,450
Omni Data Service	Training Class	2/5/88	\$4,500
Omni Data Service	Training Class	7/7/88	\$4,500
Subtotal			\$566,607
Thomas Info Systems	ATN 700	1/27/88	\$12,780
Thomas Info Systems	STS 2000	6/22/88	\$36,425
Subtotal			\$49,205
Total			\$791,149

Subtotal printed
at level 1 Break

Total printed at
level 0 Break

Figure 5-8

Columnar report with subtotals and total

Again the records have been sorted by customer and product. After the records for each customer have been printed, the subtotal for the customer is calculated and printed. After the records for the entire report have been printed, the total is calculated and printed.

The subtotal calculations take advantage of a natural division that is created by the sort order of the records. These divisions are called “Breaks,” and understanding them is vital to creating reports. As you can see in Figure 5-8, the subtotals are calculated and printed after the records for each customer. 4th DIMENSION knows when to perform the calculation and print the subtotal because it has been instructed to do so *when the value in the first sort field changes* (where it “breaks”).

The customer subtotal is calculated in what is called a level 1 break, because it is based on a change in the first sort level (in this case, the first Sort field). The grand total is calculated in a level 0 break. A level 0 break includes all the records and occurs at the end of a report.

Figure 5-9 shows another example of calculations during a break, using the same records, but using a different sort order to create a different break. This time the records have been sorted by product and customer. The subtotals are calculated when the value in the Product field changes. This is still a level 1 break, but the break is on a different field.

Sort level 2: Customer

Sort level 1: Product

Customer	Product	Date	Price
James Research	ATN 500	6/22/88	\$8,900
Subtotal			\$8,900
American Data	ATN 700	9/14/88	\$12,450
Thomas Info Systems	ATN 700	1/27/88	\$12,780
Subtotal			\$25,230
Horizon Services	ATN 850	10/18/88	\$25,364
Omni Data Service	ATN 850	1/30/88	\$20,980
Omni Data Service	ATN 850	10/5/88	\$7,900
Subtotal			\$54,244
American Data	STS 1000	3/17/88	\$22,450
Horizon Services	STS 1000	11/17/88	\$24,123
Omni Data Service	STS 1000	2/14/88	\$24,360
Subtotal			\$70,933
Thomas Info Systems	STS 2000	6/22/88	\$36,425
Subtotal			\$36,425
Horizon Services	STS 3000	5/7/88	\$74,250
Omni Data Service	STS 3000	6/22/88	\$53,252
Omni Data Service	STS 3000	4/25/88	\$71,025
Omni Data Service	STS 3000	10/1/88	\$55,230
Omni Data Service	STS 3000	9/25/88	\$47,250
Subtotal			\$301,007
Omni Data Service	STS 4000	7/14/88	\$95,420
Omni Data Service	STS 4000	8/3/88	\$89,740
Omni Data Service	STS 4000	5/17/88	\$92,450
Subtotal			\$277,610
American Data	STS Service	4/17/88	\$3,300
Subtotal			\$3,300
American Data	Training Class	6/3/88	\$4,500
Omni Data Service	Training Class	2/5/88	\$4,500
Omni Data Service	Training Class	7/7/88	\$4,500
Subtotal			\$13,500
Total			\$791,149

Subtotal printed at a level 1 break

Total printed at a level 0 break

Figure 5-9
Changed report using the same records

Additional Break Levels

You can provide additional locations for summary calculations by adding another sort level, thus creating another break level and an additional opportunity for 4th DIMENSION to calculate useful information.

Figure 5-10 on the following page shows sales records sorted by customer, product, and salesperson. Summary calculations show two sets of subtotals: One subtotal for each customer, and, within each customer, subtotals for each product for the customer. Finally, this report calculates a total for the entire company. These are examples of calculations performed at level 2 breaks, at level 1 breaks, and at the level 0 break.

Customer	Product	Date	Price
Omni Data Service	ATN 850	1/30/88	\$20,980
Omni Data Service	ATN 850	10/5/88	\$7,900
Subtotal for ATN 850			\$28,880
Omni Data Service	STS 1000	2/14/88	\$24,360
Subtotal for STS 1000			\$24,360
Omni Data Service	STS 3000	4/25/88	\$71,025
Omni Data Service	STS 3000	6/22/88	\$53,252
Omni Data Service	STS 3000	9/25/88	\$47,250
Omni Data Service	STS 3000	10/1/88	\$55,230
Subtotal for STS 3000			\$226,757
Omni Data Service	STS 4000	5/17/88	\$92,450
Omni Data Service	STS 4000	7/14/88	\$95,420
Subtotal for STS 4000			\$187,870
Omni Data Service	Training Class	2/5/88	\$4,500
Omni Data Service	Training Class	7/7/88	\$4,500
Subtotal for Training Class			\$9,000
Subtotal for Omni Data Service			\$476,867
Thomas Info Systems	ATN 700	1/27/88	\$12,780
Thomas Info Systems	ATN 700	6/22/88	\$24,745
Subtotal for ATN 700			\$37,525
Thomas Info Systems	STS 4000	8/3/88	\$89,740
Subtotal for STS 4000			\$89,740
Subtotal for Thomas Info Systems			\$127,265
Total			\$604,132

Subtotal printed at a level 1 break

Subtotal printed at a level 2 break

Total printed at a level 0 break

Figure 5-10
Subtotals at two break levels

The subtotal calculations are performed only over the group of records that precedes the break. For example, the subtotal for each product is calculated only for each product by customer. The subtotal for the customer is calculated for all products sold to that customer.

Summary Reports

You can create a report that prints only summary information. Such a report hides all the Details and displays only the subtotals and totals, with appropriate additional text. Figure 5-11 shows a report with only summary information.

Sales Summary Report

Subtotal for ATN 850	\$28,880
Subtotal for STS 1000	\$24,360
Subtotal for STS 3000	\$226,757
Subtotal for STS 4000	\$187,870
Subtotal for Training Class	\$9,000
Subtotal for Omni Data Service	\$476,867
Subtotal for ATN 700	\$37,525
Subtotal for STS 4000	\$89,740
Subtotal for Thomas Info Systems	\$127,265
Total	\$604,132

Figure 5-11
Summary report

In the report shown in Figure 5-11, the records are sorted by customer, product, and date, and the calculations are performed during the breaks created by the sort order. The details are not printed; they are used only to provide values for the calculations. (You create this kind of report by placing the Detail control line on top of the Header control line, leaving no space for details to print.)

Summary reports of this kind are useful for reporting the overall performance of a company instead of the details of individual sales.

You can ask 4th DIMENSION to perform additional calculations, including running totals, averages, maximum and minimum values, page totals to be printed in a footer, and weighted averages. These calculations, and others, require some familiarity with 4th DIMENSION's language. For a complete introduction to using the language, see the *4th DIMENSION Language Reference*. In particular, see "Printing Reports," in Chapter 13, and "Statistical Functions," in Chapter 17.

Creating Additional Control Lines

Some of the report examples shown in this section use break headers and additional break levels. To create areas for these features, you create additional control lines. You can create additional control lines for Break areas and for the headers for those levels.

In general, you create the additional control lines by holding down the Option key while clicking the appropriate control marker. You can create as many Break level control lines and Break Header lines as you need.

You should create one Break area for every level of break that will be generated by the sort. If you do not need anything printed on one of the break areas, you can reduce its size to nothing by placing its marker on top of another Break area marker. If you have more break levels than Break areas, the last Break area will be repeated during printing.

Figure 5-12 shows additional control lines.



Figure 5-12
Additional control lines for additional areas

To create a new Break line, follow these steps:

1. Hold down the Option key and click any Break marker.

4th DIMENSION creates a new Break line.

The new Break line is positioned in back of the existing line; to see the new line, you need to drag the existing line off it.

2. Drag the existing line below the new line.
3. Position both lines where you want them.

To create a new Break Header line, follow these steps:

1. Hold down the Option key and click a Header marker.

4th DIMENSION creates a new Header line.

The new Header line is positioned in front of the existing line; to see the new line, you need to drag it off the existing line.

2. Drag the new line below the existing line.
3. Position both lines where you want them.

To delete Break or Break Header lines that you have created, hold down the Command key and click on the Break line or Break Header line you want to delete.

4th DIMENSION deletes the line and renumbers the remaining lines, if necessary.

You cannot delete the original control lines H, D, B0, and F.

An Example Report

This section describes an example report and shows how the finished report is related to a layout in the Layout editor and to the scripts that control the printing.

Figure 5-13 on the following page shows a finished report.

* Similar
Tutorial Personnel 13*

Detailed Sales Report				06/27/1989
				7:44 PM
American Data				
Product	Purchase Date	Comments	Price	
ATN 700				
	9/14/88	Configured for fast access times	\$12,450	
		Subtotal for ATN 700	\$12,450	
STS 1000				
	3/17/88	Needed additional power of the 1000	\$22,450	
	4/17/88	Plan to purchase additional 1000's	\$3,300	
		Subtotal for STS 1000	\$25,750	
		Subtotal for American Data	\$38,200	
Omni Data Service				
Product	Purchase Date	Comments	Price	
STS 1000				
	2/14/88	Trying out the 1000	\$24,360	
		Subtotal for STS 1000	\$24,360	
STS 3000				
	4/25/88	Needed additional power of 3000	\$71,025	
	6/22/88	Now use 3000 as standard machine	\$53,252	
	9/25/88	Third 3000	\$47,250	
		Subtotal for STS 3000	\$171,527	
STS 4000				
	5/17/88	Needed 4000 for special application	\$92,450	
	7/14/88	Special configuration	\$95,420	
		Subtotal for STS 4000	\$187,870	
		Subtotal for Omni Data Service	\$383,757	
Thomas Info				
Product	Purchase Date	Comments	Price	
ATN 700				
	1/27/88	First purchase of ATN 700	\$12,780	
	6/22/88	Will use many 700's	\$24,745	
		Subtotal for ATN 700	\$37,525	
STS 4000				
	8/3/88	Needed 4000 for new data center	\$89,740	
		Subtotal for STS 4000	\$89,740	
		Subtotal for Thomas Info	\$127,265	
		Total	\$549,222	
Lightwave Computer Corporation				Page1

Figure 5-13
A typical report

In this example, the page header contains the date, the time, and the report title. The break headers contain column headings for the information calculated during the first break. The Detail areas contain data drawn directly from the records. The level 2 Break areas contain subtotals for products for each customer. The level 1 Break areas contain subtotals for each customer, and the level 0 Break area contains a total for the report. The footer contains the page number.

The report is sorted on one more level than break levels. In this report, the sort fields are Customer, Product, and Date. 4th DIMENSION requires one

Sort

more sort level than break level for the break processing method used in this report. There is another method that requires the same number of sort levels as break levels. For information, see the *4th DIMENSION Language Reference*, especially the “Printing Reports” section of Chapter 13. *Page 159*

The Report Layout

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Figure 5-14 shows the report layout that created the report in Figure 5-13:

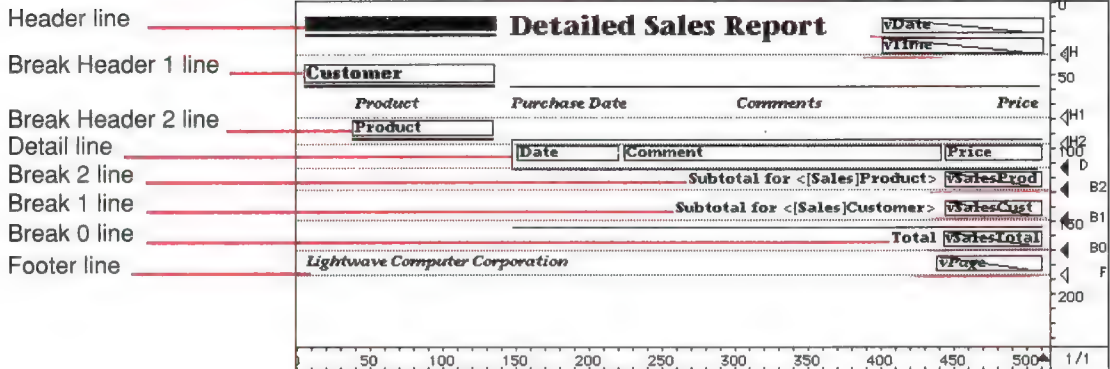


Figure 5-14
Control lines and control areas

Each control line in the layout defines the bottom of its area. Whatever is placed in the layout is printed at the appropriate place in the report. The Header area contains the elements that will be printed at the top of each page; the Detail area contains the elements that will be printed for each record; and so on.

Table 5-1 shows what each of these control lines means.

Table 5-1
Control line labels

Label	Meaning	Effect
H	Header area	Printed once at the top of each page
H1	Level 1 Header area	Printed once before each level 1 break
H2	Level 2 Header area	Printed once before each level 2 break
D	Detail area	Printed once for each record in the selection
B2	Level 2 Break area	Printed once at each level 2 break (when the value in the second Sort field changes)
B1	Level 1 Break area	Printed once at each level 1 break (when the value in the first Sort field changes)
B0	Level 0 Break area	Printed once at the end of the report
F	Footer area	Printed once at the bottom of each page

There can be additional Break areas, and additional Break Header areas.

The Report Scripts

The non-enterable objects that are placed in the Header, Break, and Footer areas are controlled by scripts. This section describes the scripts used to print values in these locations.

The date is drawn from the system date by placing a non-enterable object named `vDate` in the Header area with this script:

`vDate := Current Date`

The time is drawn from the system clock by placing a non-enterable object named `vTime` in the Header area with this script:

`vTime := Current Time`

The subtotal for sales in the level 2 Break area is calculated and displayed in an object named `vSalesProd` with the following script:

`vSalesProd := Subtotal (Sales) ([Sales] Price)`

The subtotal for sales in the level 1 Break area is calculated and displayed in an object named `vSalesCust` with the following script:

`vSalesCust := Subtotal (Sales)`

And the total for sales in the level 0 Break area is calculated and displayed in an object named `vSalesTotal` with the following script:

`vSalesTotal := Subtotal (Sales)`

Note that even though all three objects use the same calculation, they create different results. Because they are placed in different Break areas, they are executed at different times and perform their calculations over different groups of records. For an explanation of break levels, see “Report Design,” earlier in this chapter.

The page number in the Footer area is displayed in an object named `vPage` with this script:

`vPage := "Page " + String (Printing page)`

The Printing page function returns the page number.



Important: All scripts used in a report must have the “Only if modified” check box deselected. “Only if modified” is useful only in input layouts. It needs to be deselected for a script to be executed during printing.

Basic Steps for Creating a Report

Depending on the nature of the report you want to print, you can perform most or all of these steps. The actual order of steps is not critical.

Commonly, you design a report and preview it on screen, then return to the layout to make adjustments. The order given here is typical.

1. Create a layout.

You can use any of the layout templates, or you can create a custom layout.

For information about creating a layout, see Chapter 3.

2. Move the control lines so that you'll have enough space to place the various elements of the report.

For information about moving control lines and adding control lines, see "Moving Control Lines" and "Creating Additional Control Lines," earlier in this chapter.

3. Move elements into position.

You can place fields, text, non-enterable objects, and graphic objects. Take time to align the objects to one another, and to check the justification of data to be displayed in fields and active objects.

4th DIMENSION displays page size lines in the layout so that you can place elements for printing.

Place fields in relation to the sort order you plan to use so that data is printed in an understandable way. Usually, the first sort field is placed on the left of a columnar report.

For information about placing fields and active objects in a layout, see Chapter 4.

4. Adjust the control lines if necessary.

Working with the relationship between control lines and elements to be printed, you can create the right amount of space for printing the header, the details, the break, and the footer elements.

5. Create any necessary scripts to calculate values, concatenate strings of characters, print additional text, and display the date, time, and page numbers, if you have used these elements.

Be sure your scripts are not "Only if modified," otherwise the script will not execute during printing.

For information about creating scripts, see "Using Scripts," in Chapter 4.

For complete information about using 4th DIMENSION procedures, see the *4th DIMENSION Language Reference*.

6. Go to the User environment to test the report layout.
7. Create the selection of records you want to use for the report.

For information about creating a selection of records, see “Selecting,” in the *4th DIMENSION User Reference*.

8. Sort the records according to how you have designed the report.

For information about sorting records, see “Sorting,” in the *4th DIMENSION User Reference*.

9. Preview the report by printing it to the screen.

The report layout uses the Page Setup settings that were in effect when the layout was created in the Design environment. If you make any changes to the Page Setup settings, be sure to make the same changes in the Design environment.

If the report layout needs to be adjusted, return to the Design environment to make any necessary changes.

10. If the report is satisfactory, print it on the printer.

For information about printing in the User environment, see “Printing,” in the *4th DIMENSION User Reference*.

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Printing Included Layouts, Pictures, and Text Fields

You can use an included layout area in a report. The included layout area can expand during printing to print all the records.

Figure 5-15 shows a layout for a report that prints an included layout.

Layout: Included

All Coast Tool Co.
123 Main St.
Anytown, USA

Invoice

Invoice Number

Customer

Date

Terms

[Items]

Thank You for your business

Invoice Total:

Figure 5-15
Included layout area in report layout

Figure 5-16 shows the report printed from the layout in Figure 5-15.

All Coast Tool Co.
123 Main St.
Anytown, USA

Invoice

Invoice Number

Customer

Date

Terms

Quantity	Part	Description	Price
10	145-854	Looking Bit	\$75
100	187-992	Small Tap	\$45
45	232-752	Zinc coated strap iron	\$125
36	121-365	Hex Nut and washers	\$25
250	369-214	Lock Washer	\$37
75	435-878	Ring Keeper	\$289
45	145-369	Large bit grinders	\$789
150	362-785	Center drilled ring loops	\$0
150	148-255	Large Grinding bit	\$450
300	246-789	Small Grinding bit	\$375
25	123-098	Zinc Coated Straps	\$89

Thank You for your business

Invoice Total: **\$2299**

Variable printing area

Figure 5-16
Report that prints included records

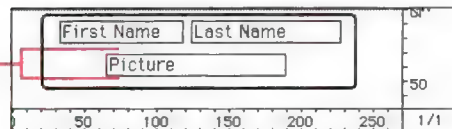
For information about included layouts, see "Using Included Layouts," in Chapter 4.

Included layout areas, picture fields, and text fields can be set to print with either fixed frame or variable frame. If the area or field is set to print with variable frame, 4th DIMENSION expands the layout to accommodate a variable amount of information. You need to take this into account when designing the layout.

Variable-frame printing allows each record as much space as necessary to print all the records in an included layout area, the entire picture in a Picture field, or the entire text in a Text field. To expand the layout, 4th DIMENSION repeatedly prints a horizontal area of the layout until the variable area is printed.

Figure 5-17 shows how variable-frame printing works.

Horizontal slice
repeated as
necessary



Picture field
expanded during
printing



Figure 5-17
Variable printing repeats a slice of the layout

When you use elements with variable printing designations, be careful when you place another object in the same horizontal area. The adjustment 4th DIMENSION makes to complete the variable printing can cause the other object to be repeated or moved out of position.

Printing Labels

You usually use the Label editor in the User environment to generate labels. But 4th DIMENSION allows you to design a custom output layout for labels, using special graphics, fonts, or scripts. You can print the labels from the User environment.

The special report format described here can be used for unusual reports that require a side-by-side placement.

To create a label report layout, follow these steps:

1. Set the label width by dragging the label width marker on the bottom ruler of the Layout editor.

The label width determines how many labels 4th DIMENSION prints across the page, as shown in Figure 5-18.

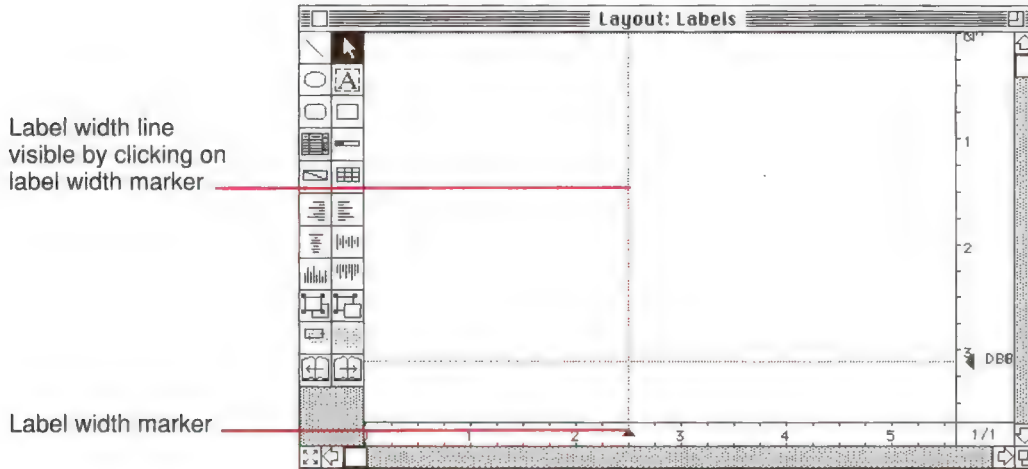


Figure 5-18
The label width marker

2. Design the label layout to the left of the label width marker.

Labels can contain fields, active and graphic objects, text, and scripts. An included layout is not printed in a label.

Figure 5-19 shows a label design in the Layout editor.

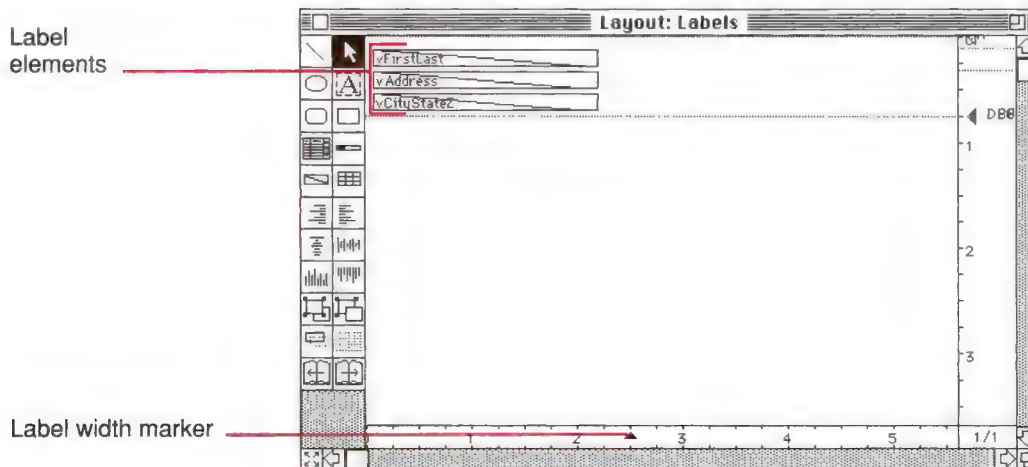


Figure 5-19
Designing a label layout

3. Go to the User environment to print the labels.

Choose Labels from the Report menu to display the Label editor.

Select "Use layout" in the Label editor in the User environment.

For complete information about using the Label editor, see the *4th DIMENSION User Reference*.

Using Embedded Fields and Variables

You can embed fields and variables in text areas. During printing, the value from the field or variable is inserted in the text. Use this capability to create mail merge documents, or any output that prints varying information within text areas.

Figure 5-20 shows fields and variables placed in a text area.

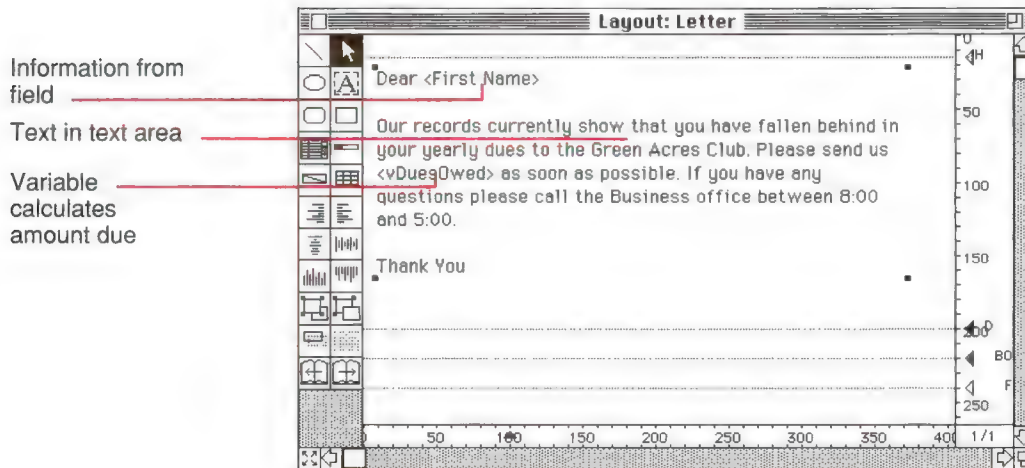


Figure 5-20
Form letter with fields and variable

To embed fields and variables in a text area, follow these steps:

1. Create a text area in the Detail area, or select one that already exists in the layout.
2. Select the Text Area tool, and create an insertion point in a text area.

Place the insertion point where you want the value from the field to be placed.

3. Type a field name or a variable name between the less than symbol (<) and the greater than symbol (>).

You can use a field from any file in the database. Fields from the master file do not have to specify the file; they can be entered like this: `<field>`. Fields from other files must specify the filename; they are entered like this: `<[file] field>`.

When the layout is printed, the information from the field for each record replaces the `<field>` element in the text area.

A variable must be defined with the language in a script or procedure. For information about defining variables, see Chapter 2 in the *4th DIMENSION Language Reference*.

4th DIMENSION provides a shortcut for inserting fields in a text area. The shortcut allows you to choose the field name from a pop-up menu.

To insert a field follow these steps:

1. Click to create an insertion point where you want the field.
2. Position the pointer in the text area, and hold down the Option key while you press and hold the mouse button.

4th DIMENSION displays a pop-up menu of fields from the master file, from which you can choose the field you want.

To choose a field from another file in the database, hold down Shift-Option while you press and hold the mouse button. 4th DIMENSION displays a pop-up menu of files in the database that displays a submenu of fields from the selected file. You can choose the file and field you want.

4th DIMENSION places `<field>` or `<[file] field>` in the text area at the insertion point.

Figure 5-21 shows the pop-up menus for fields from the master file and for fields from all files.

Option-click shows
pop-up menu of fields
from the master file

Shift-Option-click
shows pop-up menu
of all files and fields



Figure 5-21
Choosing from pop-up menus to embed fields



CREATING PROCEDURES

CREATING PROCEDURES

This chapter tells you how to create and modify 4th DIMENSION procedures. A procedure is a series of instructions that tell 4th DIMENSION to do something.

Although you can create a powerful database without writing your own procedures, the language lets you extend your database's capabilities to include

- calculated fields
- customized menus
- advanced interfaces
- special reports
- completely customized database applications

This chapter provides information on using 4th DIMENSION's Procedure editors to build and modify scripts and procedures. To learn more about 4th DIMENSION's programming language, see the *4th DIMENSION Language Reference*, which provides detailed information on the programming commands and syntax.

4th DIMENSION Procedures

4th DIMENSION provides four types of procedures:

- scripts
- layout procedures
- file procedures
- global procedures

Scripts

A script is a short procedure associated with a field or other active object in a layout. If you are familiar with spreadsheet applications, scripts are similar to macros. You create scripts in the Layout editor. The script is executed during data entry, display, and printing.

Scripts can perform many database tasks automatically. Use scripts to

- provide default and calculated values
- perform calculations
- manage buttons
- manage pop-up menus and scrollable areas
- manage thermometers, rulers, and dials
- validate entered data

Layout Procedures

A layout procedure is associated with a single 4th DIMENSION layout. 4th DIMENSION executes the instructions in the layout procedure whenever you open that layout for data entry, display, or printing. The instructions in the procedure apply only to that layout.

Use layout procedures to

- validate entered data
- provide values for fields that do not appear in the layout
- perform calculations

File Procedures

A file procedure is associated with a single database file. Unlike a layout procedure, which is associated with a single layout, the file procedure is active for every layout associated with the file. 4th DIMENSION executes a file procedure when any input layout from that file is used. You should use file procedures when you want to perform a specific action each time you use *any* input layout. In practice, file procedures are rarely used.

When you open an input layout for a file, 4th DIMENSION executes the entire file procedure before it executes the layout procedure for that layout.

Global Procedures

Global procedures can be master procedures, activated by a menu command or by choosing Execute Procedure in the User environment. Or they can be subroutines, called from within other global procedures, layout procedures, file procedures, or scripts. They are not associated with a file or layout. In a runtime application, global procedures are required to perform actions initiated by menu commands.

Use global procedures as

- custom menus for applications
- subroutine
- startup procedures

The Procedure Editors

4th DIMENSION provides two editors in which you can build, modify, and test your procedures. Each editor allows you to use a different method of writing a procedure:

- The Listing Procedure editor is a structured programming editor in which the procedure appears as a list of statements.
- The Flowchart Procedure editor is a graphically oriented editor in which the procedure appears as a chart of graphic symbols.

Figure 6-1 shows how the two Procedure editors appear on screen.



Figure 6-1a
Procedure editor (listing)

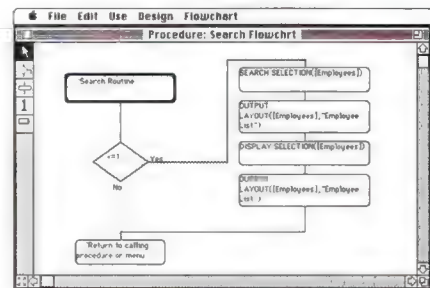


Figure 6-1b
Procedure editor (flowchart)

It is more common to use the Listing Procedure editor, unless you are familiar with the flowchart method of programming and want to create procedures as flowcharts.

In the Preferences dialog box, you can set a default editor for scripts, file, and layout procedures. If you do not set a default editor, you must choose which Procedure editor to use just before you create a new procedure. After you create a procedure, you can modify the procedure only with the same Procedure editor.



Note: You cannot use one editor to modify a procedure created with the other editor.

Creating a New Procedure

For global, layout, and file procedures, you begin in the Procedure dialog box. For scripts, you begin in the Layout editor. In all cases, you end up in one of the two Procedure editors, where you create the procedure itself.

Creating a Global Procedure

To create a global procedure, follow these steps:

1. Choose Procedure from the Design menu.



4th DIMENSION displays the Procedure dialog box, as shown in Figure 6-2.

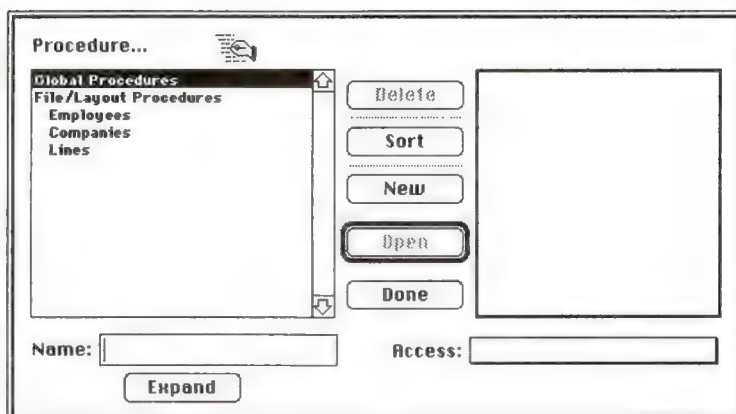


Figure 6-2
Procedure dialog box

The dialog box lists existing procedures in the Procedure area.

2. Select Global Procedures in the Procedure area.
3. Click New.

4th DIMENSION displays the “Procedure type” dialog box in which you select which Procedure editor you want to use. The dialog box also supplies a default procedure name.

4. Click Listing or Flowchart.
5. Type a procedure name (or use the default name).

Procedure names can be up to 15 characters long. They can include letters, numbers, the space character and the underline character.

6. Click OK.

4th DIMENSION opens an empty Procedure editor window, of the type you selected, where you can begin adding statements to the new procedure.

Directions for using the Listing or Flowchart editor are provided under “Using the Listing Editor,” and “Using the Flowchart Editor,” later in this chapter.

Creating a File or Layout Procedure

To create a file or layout procedure, follow these steps:

1. In the Procedure dialog box, select File/Layout Procedures in the Procedure area.
2. Click Expand.
4th DIMENSION displays the names of files in the database.
3. To create a file procedure, select the name of the file for which you want to create the procedure, and then click Open.

To create a layout procedure, expand the filename that contains the layout you want, select the layout, and then click Open.

If you haven’t specified a Procedure editor type in the Preferences dialog box, 4th DIMENSION displays the “Procedure type” dialog box so that you can select the Procedure editor you want to use.

4. Select Listing or Flowchart.
5. Click OK.

4th DIMENSION opens an empty Procedure editor window, where you can begin writing the new procedure.

Directions for using the Listing or Flowchart editor are provided under “Using the Listing Procedure Editor,” and “Using the Flowchart Procedure Editor,” later in this chapter.

Creating a Script

To create a script, follow these steps:

1. In the Layout editor, open the Field Definition or Object Definition dialog box for the field or active object for which you want to create a script, and click Script. Or in the Layout editor, hold down the Option key and click the field or active object.

If you haven’t specified a Procedure editor type in the Preferences dialog box, 4th DIMENSION displays the “Procedure type” dialog box so that you can select the Procedure editor you want to use.

2. Select Listing or Flowchart.

3. Click OK.

4th DIMENSION opens an empty Procedure editor window, where you can begin writing the new script.

Directions for using the Listing or Flowchart editor are provided under “Using the Listing Editor” and “Using the Flowchart Editor,” later in this chapter.

Opening an Existing Procedure

After you create a procedure, you can reopen it and make changes. 4th DIMENSION automatically opens the same Procedure editor that you used to create the procedure.

You can open any existing procedure from the Procedure dialog box. If you want to work with a layout procedure, you can also open it through the Layout dialog box. You can open scripts only through the Layout editor.



Note: You cannot delete layout procedures, file procedures, or scripts. To disable a procedure or script, erase all the commands in the procedure or script. For a script, you can also delete the object and then replace it with a new object.

To open an existing procedure from the Procedure dialog box, follow these steps:

1. Choose Procedure from the Design menu.
2. In the Procedure dialog box, expand the list of procedures so that the one you want is displayed.
3. Select the procedure you want to use, and then click Open. Or double-click the procedure name.

4th DIMENSION displays the procedure in the Procedure editor window.

To open a layout procedure from the Layout dialog box, follow these steps:

1. Choose Layout from the Design menu.
2. In the Layout dialog box, expand the list and select the name of the layout whose procedure you want.
3. Click Procedure.

4th DIMENSION displays the layout procedure in the Procedure editor window.

To open a script, follow these steps:

1. Open the layout that contains the object to which the script is attached.
2. Open the Field Definition or Object Definition dialog box for the field or object, and then click Script. Or hold down the Option key as you click the object.

4th DIMENSION displays the object's script in the Procedure editor window.

Using the Listing Editor

4th DIMENSION's Listing editor is a text editor. When you create a procedure with the Listing editor, you write the procedure as a list of text statements. You can also select elements of the procedure from lists provided by the editor.

You can scroll through the procedure. Although a procedure is rarely longer than a page, you can enter up to 32,767 characters (roughly 25 pages) in a procedure.

Figure 6-3 shows the Listing editor.

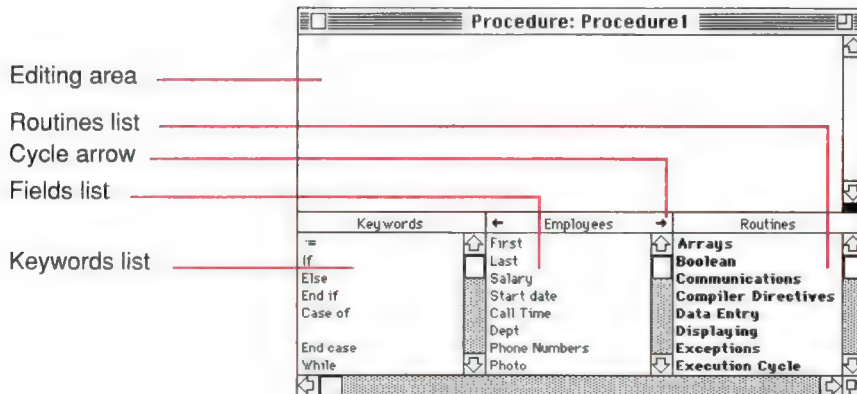


Figure 6-3
The Listing editor

The Listing editor contains four areas:

- **Editing area:** The editing area contains the text of the procedure. You enter and modify the procedure text in this area. The editor automatically indents procedure text for clear program structure. You can include comments inside the procedure text for reference.
- **Keywords list:** The Keywords list is a scrollable area that provides commonly used programming keywords such as If or Case of. A keyword is a word, symbol, or phrase that has a specific use in a procedure statement. When you click a keyword, 4th DIMENSION inserts it at the location of the insertion point in the editing area.

- **Fields list:** The Fields list displays the names of fields and layouts in the database. You click field names to enter them at the location of the insertion point in the editing area. The area's title bar displays the name of the file whose fields and layouts appear in the list. You can display fields and layouts from other files by clicking the cycle arrows in the title bar. Clicking a filename inserts it in the procedure at the location of the insertion point.

If no filename appears in the title bar, the fields displayed are from the master file.

When you include a field name in the procedure by clicking in the field area, 4th DIMENSION automatically provides the correct field syntax, adding filenames or subfilenames as required. If you click the name of a subfile field, 4th DIMENSION opens a window where you can select a subfield name.

Layout names are added to the end of the list of fields for each file. Clicking a layout name inserts it in the procedure at the location of the insertion point.

- **Routines list:** The Routines list displays the names of all 4th DIMENSION programming commands and functions. The routines are grouped according to their function. Each group name is a pop-up menu from which you can choose an individual command or function.

To display an alphabetical list of commands and functions, click the title bar of the Routines list. At the end of the list of routines, 4th DIMENSION displays the names of global procedures that you have developed and external procedures added to the database.

Figure 6-4 shows the commands displayed in groups and in alphabetical order.

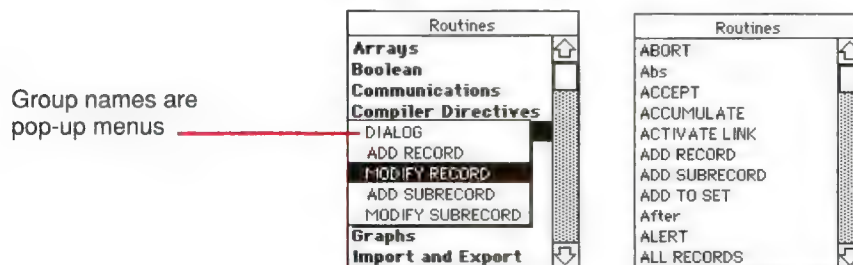


Figure 6-4
Routines displayed in groups and in alphabetical list

If you prefer writing procedures without selecting components from the Keyword, Field, and Routines lists, you can suppress their display by setting an option in the Preferences dialog box. See Chapter 1 for more information on setting preferences.

Writing a Procedure

Writing a procedure is usually a combination of typing and selecting elements. You can successfully create procedures by typing the entire text, if you want. You can select elements of the procedure from the Keywords, Fields, and Routines lists, and you can use the “at” sign (@) wildcard to speed the creation of procedures.

The 4th DIMENSION procedure editors provide basic syntax error-checking. Additional error-checking is performed when the procedure runs.

Typing Text

4th DIMENSION uses standard Macintosh text editing techniques for typing and editing in the Listing editor.

As you type, the characters appear at the location of the insertion point. End each line by pressing Return.

You can move the insertion point by clicking at the location you want. You can select words, whole lines, or several lines by dragging the I-beam pointer over them.

You can use the arrow keys to quickly move from line to line. Using the arrow keys to move across several lines is quick because the editor delays evaluating the line for errors.

When you press Return, 4th DIMENSION automatically indents each line to its proper level in relation to the preceding line. 4th DIMENSION also automatically changes commands and functions to bold type.

Figure 6-5 shows a procedure in the Listing editor.

Command
shown in bold

Line indented
to show level

Insertion point

I-beam pointer

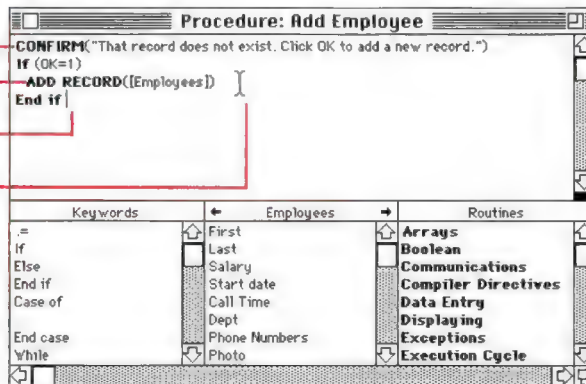


Figure 6-5
A sample procedure

Selecting Procedure Elements

You can quickly enter keywords, filenames, fields, layout names, commands, and functions by selecting them from the Keywords, Fields, and Routines lists in the lower portion of the window. Select elements from these lists to ensure accuracy and for speed.

When you click an element, 4th DIMENSION inserts it at the insertion point in the editing area, using the correct syntax for that element. The element can be modified as normal text.

Using the Wildcard Character

You can enter most commands and filenames by typing the first few characters and the wildcard character (@). 4th DIMENSION automatically searches the list of routines and filenames, and enters the command, function, or filename that begins with those characters.

Double-check each entry. You must type enough of the routine or filename so that it is distinct from any other routine or filename. If more than one routine or filename fits the instruction, 4th DIMENSION picks the first one that fits. A filename always begins with a left bracket ([).

Checking and Correcting Syntax Errors

4th DIMENSION automatically checks the procedure syntax to see if it is correct. If you enter text or select an element that is not compatible with proper syntax, and if you press Return to end the line, 4th DIMENSION marks the error with bullets, as shown in Figure 6-6.

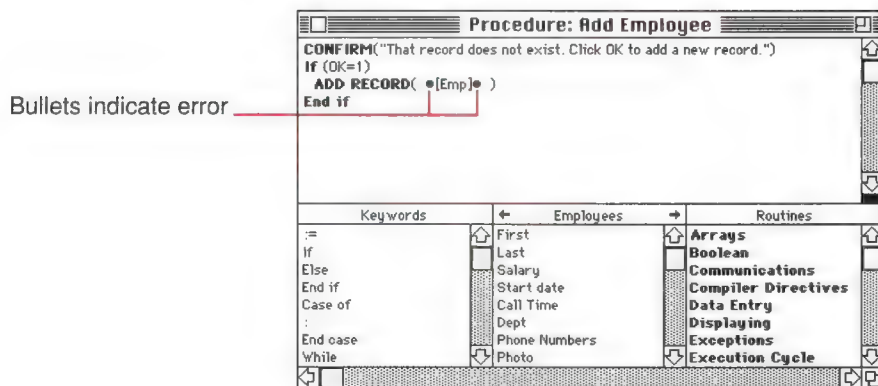


Figure 6-6
Syntax errors marked with bullets

You can immediately check the syntax of the current line by pressing the Enter key. 4th DIMENSION evaluates the line, formats it, marks any errors, and places the insertion point at the end of the line.

When a line of a procedure is marked as having improper syntax, fix the entry and press Enter. If the line is now correct, 4th DIMENSION removes the bullets.

The Listing editor can check only for obvious syntax errors (misspellings and the like). It does not check for errors that occur only during execution. Execution errors are trapped by 4th DIMENSION when the procedure is executed. 4th DIMENSION provides tools for handling and correcting these errors. For more information about language error-handling, see Chapter 8, “Debugging,” in the *4th DIMENSION Language Reference*.

Finding and Replacing Text

When the Listing Procedure editor is active, 4th DIMENSION provides the Search menu for performing search-and-replace operations on a procedure. Use the Search menu to locate character strings in a procedure and, if necessary, replace these characters with new ones. 4th DIMENSION searches only from the current position of the insertion point to the end of the procedure.

Figure 6-7 shows the Search menu.

Search	
Find...	⌘F
Find Next	⌘G
<hr/>	
Replace...	⌘R
Replace Next	⌘T

Figure 6-7
Search menu

Here is a description of the Search menu commands:

- **Find:** Opens a dialog box in which you specify a character string for a search. When you click OK, the editor finds and selects the next occurrence of the string. The editor searches from the location of the insertion point to the end of the procedure.

If you select text prior to choosing Find, the text is entered as the string to search for. You can use this text or replace it by typing.

- **Find Next:** Performs the previously defined search again.
- **Replace:** Opens a dialog box in which you specify a character string for a search-and-replace operation. The procedure editor searches from the current location of the text insertion cursor to the end of the procedure. When it finds text that matches the character string, it replaces it with the new character string.

If you select text prior to choosing Replace, the text is entered as the target string to search for. You can use this text or replace it by typing.

- **Replace Next:** Performs the previously defined search-and-replace operation again.

Managing the Listing Editor Window

You can change the relative sizes of the Editing area and the other scrollable areas in the Procedure window to fit your needs. Just drag the black bar—the Hide Keywords divider—that separates the Editing area from the list areas.

Figure 6-8 shows the Hide Keywords divider.

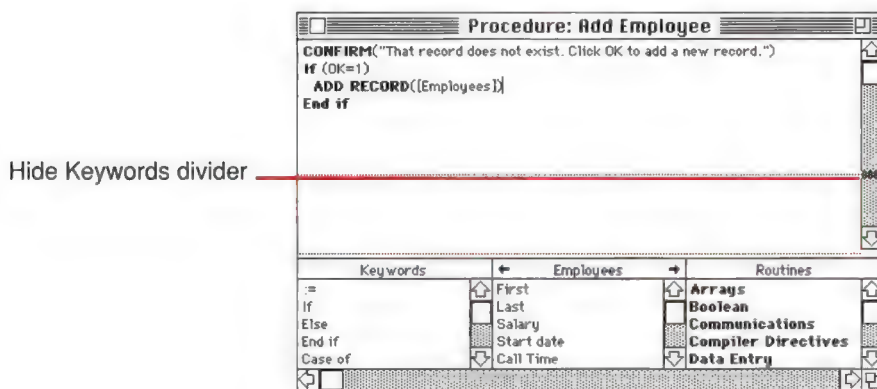


Figure 6-8
Dragging the Hide Keywords divider

By dragging the divider up, you increase the number of keywords, fields, and routines that you can see. By dragging the divider down, you reduce or remove the Keywords, Fields, and Routines lists completely. You can also hide the Keywords and the other lists by setting an option in the Preferences dialog box. See Chapter 1 for more information on setting preferences.

The Flowchart Editor

The Flowchart editor lets you create and edit 4th DIMENSION procedures graphically, by adding steps and tests to a flowchart. The Flowchart editor lets you create the same kinds of procedures that you create with the Listing editor, except that you build your procedures visually.

You can think of a flowchart as resembling plumbing in a house. The procedure, like water, flows through the pipes and its movement is determined by the state of valves in the plumbing. If a valve is open (TRUE), the water (procedure) will flow through. If the valve is not open (FALSE), the flow will stop at that point, or go elsewhere.

Figure 6-9 shows an example flowchart procedure.

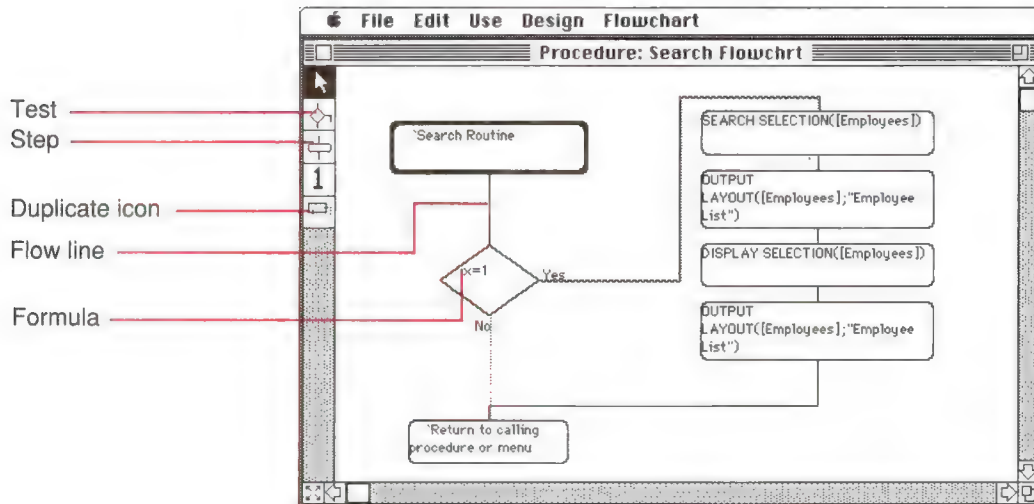


Figure 6-9
The Flowchart editor

In a flowchart, there are two types of objects: steps and tests. In addition, there are flow lines that connect steps and tests. Each step and test also has a formula that defines the operation of the step or test. The formula is written in a dialog box. The flowchart palette provides icons that you click to create steps and tests, to set a new starting point, and to duplicate objects.

Here are descriptions of the four major Flowchart Procedure elements:

- **Step object:** Directs 4th DIMENSION to perform a specific operation or calculation (a statement). For example, a step can use the NEXT RECORD command to make the next record in the database the current record. Unlike a test, a step is not conditional—the event in the step occurs each time the procedure executes the step.
- **Test object:** Tells 4th DIMENSION to evaluate a condition (a Boolean expression) to determine the direction that the procedure will follow. A test must evaluate to TRUE or FALSE. Each test object has two flow lines leading to other steps or tests—a Yes flow line and a No flow line. For example, a test can be associated with a condition such as “Salary >= 50000”. When 4th DIMENSION reads the contents of the

Salary field, it will follow the Yes flow line if the field contains a value greater than or equal to 50,000.

- **Flow lines:** Flow lines connect the steps and tests in the flowchart and provide the direction of movement through the flowchart.

The direction of movement is shown by the way a flow line enters and leaves a step or test. The flow line that connects the top of a step or test brings information or instructions to the step or test. The result of a step flows out the bottom of a step. The Yes result of a test flows out the side of a test; the No result of a test flows out the bottom of a test.

- **Formulas:** Each step and test must be associated with a one-line formula. The formula defines the precise step to be carried out or test to be performed. The process of creating a formula is described later in this section.

The Flowchart Menu

When the Flowchart editor is active, 4th DIMENSION provides a menu for performing flowchart operations on a procedure. These commands duplicate the functions of the icons in the flowchart palette.

Figure 6-10 shows the Flowchart menu.



Figure 6-10
Flowchart menu

The Flowchart menu contains these commands:

- **New Step:** Adds a new step object to the flowchart.
- **New Test:** Adds a new test object to the flowchart.
- **Set as Start:** Specifies a new starting point in the flowchart.

Creating a Flowchart Procedure

There are three basic steps for creating a procedure with the Flowchart editor:

1. Use the icons in the palette or the Flowchart menu commands to add steps and tests in the Flowchart window.
2. Create a formula for each step and test in the window.
3. Draw flow lines between the objects.

4th DIMENSION provides basic syntax error-checking. Other error-checking is performed when the procedure runs.



Creating Steps and Tests

1. With the Flowchart editor active, click the Step or Test icon in the palette. Or choose New Step or New Test from the Flowchart menu.

When you move the cursor into the Flowchart area, it becomes a crossbar.

2. Position the crossbar where you want the upper-left corner of the object to appear and click on the location.

4th DIMENSION creates the test or step. The crossbar becomes the standard pointer again.

Creating a Formula

You use a formula (a one-line procedure) to control each step or test. To create a formula, follow these steps:

1. Double-click the Step or Test object for which you want to create a formula.

4th DIMENSION displays the Formula editor, as shown in Figure 6-11.

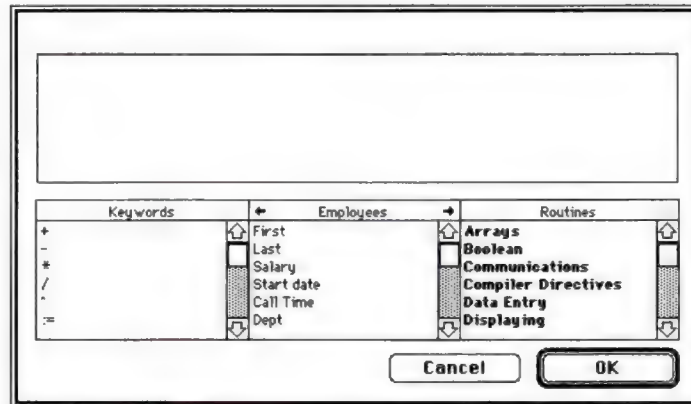


Figure 6-11
The Flowchart formula editor

The Formula editor contains the same four areas as the Listing editor. You use the Formula editor in exactly the same way as the Listing editor, except that the Formula editor exists in a dialog box, not an editor window, and it allows only one-line statements. You cannot move or resize the dialog box, nor can you change the relative size of the editing area and the lists at the bottom.

The formula, like a procedure, can contain up to 32,000 characters.

A step formula must result in an instruction to do something. The statement ADD RECORD is an example of a step formula.

A test formula must result in TRUE or FALSE (a Boolean expression). OK=0 is an example of a test formula.

As you create formulas for steps and tests, 4th DIMENSION automatically checks the formula syntax to see if it is correct. If you enter text or select an object that is not compatible with proper syntax, 4th DIMENSION marks the error with bullets.

2. Write the formula, and then click OK.

4th DIMENSION displays the Flowchart editor. The formula is displayed in the step or test for which it was created.

Drawing Flow Lines

To define the flow of a procedure through the chart, you need to draw flow lines between the objects in the Flowchart window. To draw a flow line, follow these steps:

1. Position the pointer on the lower boundary of a step object, or on one of the corners of a test object.

The pointer becomes a small, upward-pointing arrow.

To draw a Yes line from a test, position the pointer on the left or right corner; to draw a No line from a test, position the pointer on the bottom corner.

2. Drag away from the object and towards the object to which you want to connect the flow line.

Figure 6-12 shows a flow line being drawn.



Figure 6-12
Drawing a flow line

3. Release the mouse button at the border of the object you want to connect.

4th DIMENSION draws a flow line between the two objects.

4th DIMENSION lets you draw through other objects to connect objects in the flowchart.

If you are drawing flow lines from a test object, 4th DIMENSION automatically labels the lines as Yes and No.

To erase a flow line, follow these steps:

1. Position the pointer on the flow line you want to delete.
2. When the pointer becomes a small, upward-pointing arrow, drag the line to an area between objects (so that the pointer is not touching any object) and release the mouse button.

The selected flow line disappears.

Specifying a First Step

When you create a flowchart procedure, the first step you create is shown in bold outline, indicating that it is the first step. The first step is where the procedure begins when it executes. You can change the first step at any time. Setting a new first step is a way to isolate parts of the flowchart procedure in order to debug problems.

When you set a new first step, 4th DIMENSION ignores all steps and tests before the new starting point.

To set a new first step, follow these steps:

1. Select the step you want to specify as the first step in the procedure.
2. Click the Set as Start icon in the palette. Or choose Set as Start from the Flowchart menu.

4th DIMENSION displays the step in bold as the new starting point.

Editing a Flowchart Procedure

You can change the way a flowchart is displayed, moving and resizing the elements so that the flowchart is clear and easy to read. And you can change the formulas that define the steps and tests.

There are several ways to select flowchart objects:

- Click the test or step in the Flowchart editor window.
4th DIMENSION highlights the selected object.
- Select multiple objects by dragging a selection rectangle around the tests or steps you want to select.
- Select multiple objects by pressing Shift while clicking the tests or steps you want to select.

To move an object, follow these steps:

1. Select the object in the Flowchart editor window.
2. Drag the object to its new location in the window.

If there are flow lines connected to the object you are moving, they follow the object.

To resize an object, follow these steps:

1. Select the object in the Flowchart window.
4th DIMENSION highlights the step or test, and displays a resizing handle in the upper-left corner.
2. Move the pointer over the resizing handle on the selected object.

The pointer changes into a multi-directional arrow, as shown in Figure 6-13.

Pointer changes
when positioned
on the handle

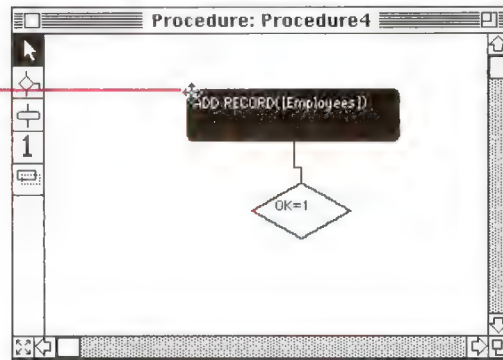


Figure 6-13
Resizing an object

3. Drag the handle toward the center of the object to shrink it, or away from the center to enlarge it.

4th DIMENSION resizes the object.

To duplicate an object, follow these steps:

1. Select the object or objects that you want to duplicate.
2. Click the Duplicate icon in the palette.

4th DIMENSION duplicates the object or objects. If you previously assigned a formula to the object, the copy possesses the same formula as the original.



To delete an object, follow these steps:

1. Select the object or objects that you want to delete.
2. Choose Clear from the Edit menu.

Or

Press the Backspace key.

4th DIMENSION deletes the selected object or objects. The deletion also removes any flow lines connected to the deleted object.

To edit a formula for a step or test, follow these steps:

1. Double-click the test or step object whose formula you want to edit.

4th DIMENSION displays the Formula editor. The existing formula appears in the Formula area.

2. Edit the formula, using the editing techniques described in “Writing a Procedure” earlier in this chapter.

Also, see the *4th DIMENSION Language Reference* for more information on programming commands and syntax.

3. Click OK to accept the formula and return to the Flowchart window.

Click Cancel to discard the formula or editing changes and return to the Flowchart window.

Formula Syntax Errors

4th DIMENSION automatically checks the formula syntax to see if it is correct. If you enter text or select an element that is not compatible with proper syntax, and if you press Return to end the line, 4th DIMENSION marks the error with bullets, as in the Listing editor. You can immediately check the syntax of the current line by pressing the Enter key.

4th DIMENSION evaluates the line, formats it, marks any errors, and places the insertion point at the end of the line.

When a formula is marked as having improper syntax, fix the entry and press Enter. If the line is now correct, 4th DIMENSION removes the bullets.

The Formula editor can check only for obvious syntax errors (misspellings and the like). It does not check for errors that occur only during execution. Execution errors are trapped by 4th DIMENSION when the procedure is executed. 4th DIMENSION provides tools for handling and correcting these errors. For more information about language error-handling, see Chapter 8, “Debugging,” in the *4th DIMENSION Language Reference*.



CREATING CUSTOM MENUS

CREATING CUSTOM MENUS

You can create custom menus for your databases and runtime applications. Because pull-down menus are a standard feature of the Macintosh user interface, their addition will make your databases easier to use, and will make them feel more familiar to users. With menus, your databases will perform more like “stand-alone” applications.

When you create a runtime application, you must create at least one menu bar with at least one menu. (See the *4th DIMENSION Language Reference* for detailed information on creating runtime applications.)

Designing Menus

In general, menus provide commands that the user chooses to perform database tasks: modifying records, searching for records, printing reports, and so on. Figure 7-1 shows an example of a custom menu.



Figure 7-1
Menu bar, menus, and menu items

A menu bar is a group of menus that can be displayed on a screen together. Each menu on a menu bar can have many items in it, including lines that divide the menu items into groups. A menu item, when chosen, calls a global procedure that performs an operation. Menu items are sometimes called menu commands.

Each menu bar you create has, by default, the Apple menu that displays your desk accessories, the File menu with the Quit command, and the Edit menu with the standard Undo, Cut, Copy, and Paste menu items. You cannot edit the Apple menu or the Edit menu. You can add items to the File menu, and you can add as many other menus as you like. As a practical limit, the small Macintosh screen can display seven or eight menus, depending on the length of the menu titles.

You can have many separate menu bars for each database. You can use one menu bar that contains menus for standard database operations, and another that becomes active only for reporting. One menu bar may contain a menu with commands for entering records, whereas the menu bar that appears with the input layout may contain the same menu, but with the commands dimmed because the user doesn't need them during data entry.

When you design menus, keep two rules in mind:

- Use menus for functions that are suited to menus.

Menu items should perform fairly large-scale procedures such as adding a record, searching for records, or printing a report.

- Group items by function.

A user should be able to go to a menu of associated commands to find a menu option. For example, all commands that browse through database records should be in the same menu. For another example, you might have all operations for a certain group of records on one menu.

You use the Menu editor to create menus. You can perform these operations in the Menu editor:

- Specify styles for menu items.
- Specify keyboard equivalents for menu items.
- Add dividing lines to menus.
- Assign password groups to menu items.
- Enable or disable menu items.
- View sample menus while you are creating the menu structure.
- Paste in a custom graphic associated with each menu bar.

Each of these tasks is explained in this chapter.

Creating Menus

4th DIMENSION allows you to create entire menu bars. A menu bar is the collection of menus that appear at the top of your Macintosh screen. The menu bar displays the menu titles; the menus pull down to display the menu items. Every menu item should be associated with a global procedure.

Basic Steps for Creating Menus

These are the steps for creating custom menus:

1. Create one or more menu bars. See “Creating a Menu Bar,” later in this chapter.
2. Create the menus that will pull down from the menu bar. See “Adding Menus,” later in this chapter.
3. Add menu items to each menu in the menu bar. See “Adding Menu Items,” later in this chapter.

4. Assign a global procedure to each menu item. When the user chooses that item, the procedure performs the operation associated with it. See “Assigning Procedures to Menu Items,” later in this chapter.
5. Write the global procedures that perform the menu commands. See Chapter 6 for more information on using the Procedure editors. See the *4th DIMENSION Language Reference* for detailed information about 4th DIMENSION’s programming language.
6. Make any enhancements you want, such as special font styles, separator lines, keyboard shortcuts, and so on. See “Enhancing Menus,” later in this chapter.
7. Assign password access groups to menu items (optional). See Chapter 8, “Managing Password Access.”

Creating a Menu Bar

To create a menu bar, follow these steps:

1. Choose Menu from the Design menu.

4th DIMENSION displays the Menu Bars dialog box, which lists any menu bars previously created for the database. See Figure 7-2.

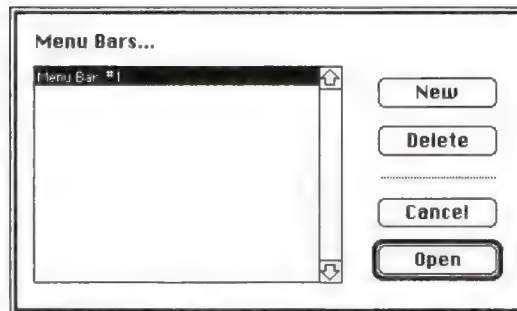


Figure 7-2
Menu Bars dialog box

4th DIMENSION assigns menu bar numbers sequentially—Menu Bar #1 appears first. You cannot change menu bar numbers.

Important: If you delete a menu bar, 4th DIMENSION automatically renumbers any remaining menu bars. If you refer to menu bars in a procedure, you may need to update the procedure to reflect new menu bar numbers.

2. Click New.

The new menu bar appears in the Menu editor window, as shown in Figure 7-3.

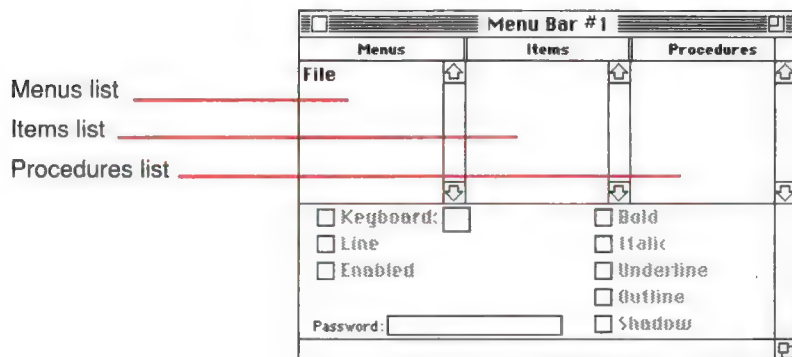


Figure 7-3
Menu editor

The editor window displays the name and number of the new menu bar.

At this point, you can begin assigning menus to the menu bar and adding menu items to the menus.

The Menu editor window displays menu information in three lists.

- The Menus list displays the name of each menu in the menu bar.
- The Items list displays the name of each menu item in the menu selected in the Menus list.
- The Procedures list displays the name of the procedure assigned to each menu item in the Items list.

Notice that the File menu appears in the Menus list, but neither the Apple menu nor the Edit menu appears. You can add items to the File menu, but you cannot edit the Apple or Edit menu. When the menu bar is in use, the Apple, File, and Edit menus occupy the first three places at the left end of the menu bar.



Note: The File menu should always include Quit as the last item. 4th DIMENSION automatically adds the Apple and Edit menus to the menu bar when the menu bar is displayed.

Adding Menus

You can add menus to either a new or an existing menu bar.

The number of menus you can add to a menu bar depends on the size of your screen—a large display can show more menus than the screen of a Macintosh Plus or SE. If the runtime application will be used on a standard Macintosh screen, make sure that the menu bar will fit in the smaller display area.

There are two ways to add menus:

- Append a new menu to the end of the current list of menus.
- Insert a new menu anywhere in the current list of menus.

To append a menu, follow these steps:

1. With the Menu editor window open, choose Append Menu from the Menu menu. Or double-click in the space below the last menu in the Menus list. Or select the last menu name and press Return.

4th DIMENSION frames an area at the end of the Menus list so that you can enter the menu title.

2. Type the name of the new menu in the box.

The maximum length for a menu title is 15 characters. Additional characters are ignored.

As you enter the menu name, 4th DIMENSION displays the name to the right of the current menu bar to show how it will look in the finished application. You can pull down this sample menu in the same way that you pull down active 4th DIMENSION menus. When you add menu items, they appear in this sample menu.

Figure 7-4 shows a menu being added to a menu bar.



Figure 7-4
Adding a new menu

Repeat steps 1 and 2 to add more menus.

To insert a menu, follow these steps:

1. In the Menu editor window, select the menu that is to appear below the menu you are adding.

4th DIMENSION inserts the new menu above whichever menu is currently selected. This allows you to insert a new first menu.

2. Choose Insert Menu from the Menu menu.

4th DIMENSION frames an area above the previously selected menu title so that you can enter the new menu title.

3. Type the name of the new menu in the box.

Adding Menu Items

For each menu in the menu bar, you must create the menu items—the commands that appear when the menus are pulled down.

The standard Macintosh screen can display up to 18 menu items at one time. The user can scroll additional menu items into view to choose them.

There are two ways to add menu items to the Items list in a Menu editor window:

- Append a new menu item to the current list of menu items.
- Insert a new menu item at any point in the current list of menu items.

To append a menu item, follow these steps:

1. Select the menu that you want to provide with a menu item.
2. Choose Append Item from the Menu menu. Or double-click in the space below the last menu item in the Items list.

4th DIMENSION frames an area at the end of the Items list so that you can enter text. A frame also appears in the Procedures list so that you can enter a procedure name.

3. Type the name of the new menu item in the box.

Any menu item you add appears in the sample menu on your current menu bar when you pull down the menu.

Repeat steps 1 through 3 to add more menu items to the Items list.

To insert a menu item, follow these steps:

1. In the Menu editor window, select the item that is to appear below the item name you are adding.

4th DIMENSION inserts a new menu item above whichever item is currently selected. This allows you to insert a new first item.

2. Choose Insert Item from the Menu menu.

4th DIMENSION frames an area above the previously selected item name so that you can enter the new item name. A frame also appears in the Procedures list so that you can enter a procedure name.

3. Type the name of the new menu item in the box.

Any menu item you add appears in the sample menu on your current menu bar.

Assigning Procedures to Menu Items

To enable a menu to perform its function, you must assign global procedures to the menu items. These procedures perform the actual functions indicated by the menu items. For example, the menu item Monthly Report can call a global procedure that prepares a monthly report from a file of financial data.

In the Menu editor, each menu item is assigned a global procedure in the Procedures list. When a menu item is chosen, 4th DIMENSION executes the global procedure assigned to it.

You create the global procedure with a 4th DIMENSION Procedure editor. You can create the procedure before or after you assign it to the menu item. For information about using the Procedure editors, see Chapter 6. For complete information about using 4th DIMENSION's language, see the *4th DIMENSION Language Reference*.

You can assign the procedure when you create the menu item or at a later time.

To assign a procedure to a menu item, follow these steps:

1. Create the menu item, or select it if it already exists.

When 4th DIMENSION frames an area for the menu item, it also frames an area in the Procedures list for the procedure name.

2. Select the area in the Procedures list.
3. Type the name of the global procedure you want to assign to the menu item.



Note: If you change the name of a procedure that is used in a menu, you must update the procedure name here in the Menu editor.

Enhancing Menus

You can change the font style of menu items, add separator lines between groups of menu items, assign a keyboard equivalent for an item, and enable or disable items.

Figure 7-5 on the following page shows the Menu editor being used to enhance a menu item.

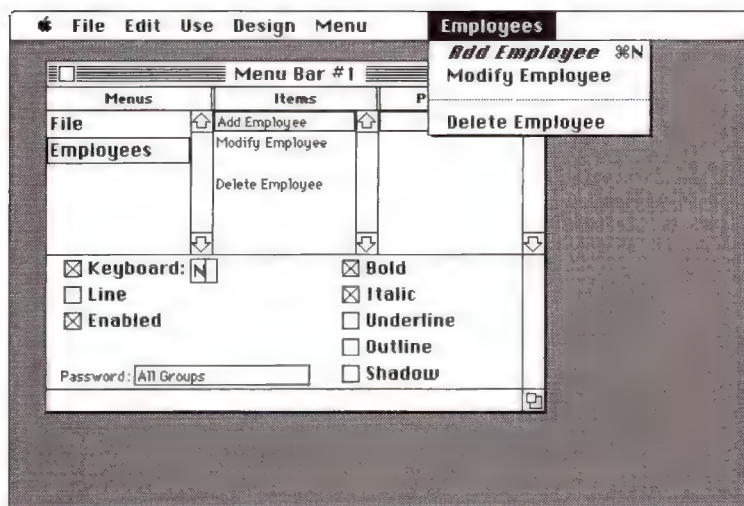


Figure 7-5
Using the Menu editor to enhance menu items

Changing Font Styles

4th DIMENSION lets you customize menus by applying different font styles to the menu items.

You can customize your menus with these styles:

- Bold
- Italic
- Underline
- Outline
- Shadow

Be cautious when applying font styles to your menus—too many styles will be distracting to the user and give a cluttered look to your application.

To apply a style, select the menu item you want to embellish, and then choose the style from the check boxes.

Enabling and Disabling Menu Items

You can specify whether a menu item will appear enabled or disabled. An enabled menu item can be chosen by the user; a disabled menu item is dimmed and cannot be chosen. Unless you specify otherwise, 4th DIMENSION enables each menu item you add to a custom menu.

To enable or disable a menu item, follow these steps:

1. Select the menu item you want to enable or disable.

2. To enable the menu item, select Enabled.

To disable the menu item, deselect Enabled.

If the Enabled check box is selected, the menu item appears black in the menu. If the Enabled check box is deselected, the menu item appears dimmed, signifying that it cannot be chosen.

Adding Separator Lines

Groups of menu items in a menu can be separated by a dotted line. This convention is useful for grouping associated commands by function.

Figure 7-6 shows a menu with a separator line.



Figure 7-6
Menu with separator line

To add a separator line, follow these steps:

1. Select the menu you want to work with in the Menus list.
The menu items for that menu appear in the Items list.
2. Choose Insert Item or Append Item to frame a location in the Items list where you want to add the separator line.
3. Click Line.
In your Items list, the framed area remains blank. The separator line does not appear in the editor window.
4. Click Disabled so that the line cannot be chosen.
5. Pull down the sample menu to see how the separator line appears in the menu.

Assigning Keyboard Equivalents

In standard Macintosh applications, there are some menu commands that you can choose by pressing a combination of keys rather than by using the menu. These commands are said to have keyboard equivalents.

If a command has one of these shortcuts, you'll usually see a symbol for it next to the menu item. For example, "⌘C" appears next to the Copy command on the Edit menu. This means you can copy a selection by holding down the Command-key (⌘) and pressing the C key.

4th DIMENSION lets you assign keyboard equivalents to the items in your custom menus. You can use any alphanumeric keys in combination with the Command key as a keyboard equivalent except for the keys reserved by standard Macintosh commands that appear in the Edit and File menus. These reserved key combinations are shown in Table 7-1.

Table 7-1
Reserved Keystrokes

Key	Operation
Command-C	Copy
Command-Q	Quit
Command-V	Paste
Command-X	Cut
Command-Z	Undo
Command-. (period)	Stop action

To assign a keyboard equivalent, follow these steps:

1. Select the menu item to which you want to assign a keyboard equivalent.
2. Click Keyboard.
3. In the Keyboard entry box, type an alphanumeric character that you want to associate with the command.

The user can choose the menu command by holding down the Command key and pressing the assigned key.

4. Pull down the sample menu to see how the keyboard equivalent appears in the menu.



Note: An active object can also have a keyboard equivalent. If Command key assignments are duplicated, the active object takes precedence.

Editing Menus and Menu Items

You can copy, move, and delete menus and menu items.

Copying and Moving Menus

You can copy a menu to place it on a different menu bar. You can move a menu to a different menu bar, or to a new location on the same menu bar.

When you copy or move a menu, you are copying or moving the menu title, all menu items, and their associated procedure names.

To copy a menu, follow these steps:

1. Select the menu you want to copy in the Menus list.

When you select a menu, the names of commands assigned to the menu appear in the Items list.

Do not select any text in the menu title, otherwise only the selected text is copied.

2. Choose Copy from the Edit menu.

4th DIMENSION copies the menu, menu items, and procedures to the Clipboard.

3. Create a new menu bar where you want the copied menu to appear.

You can append a menu to the bottom of the list of menus, or insert the menu between other menus.

4. Choose Paste from the Edit menu.

4th DIMENSION pastes the menu, menu items, and procedures into place.

To move a menu, use the Cut command on the Edit menu instead of the Copy command. If you want to insert the new menu, first select a current menu. If you want to append, click the last menu.

Deleting Menus

You can remove a menu at any time. A deleted menu no longer appears on the menu bar. You might not want a particular menu on a certain menu bar. You might delete a menu after you have placed its menu items on other menus. Or you might delete menus that you have placed on different menu bars.

To delete a menu, follow these steps:

1. Select the menu you want to delete in the Menus list.

When you select a menu, the names of commands assigned to the menu appear in the Items list.

Double-check to make sure this is the menu you want to delete.

2. Choose Delete Menu from the Menu menu.

4th DIMENSION removes the menu from the Menus list. The deleted menu will no longer appear in the application's menu bar.

Deleting Menu Items

You can delete a menu item at any time. You might delete a menu item that is out of date. You might delete a menu item after you have placed it on another menu. Or you might delete a menu item that has been replaced by another menu item.

To delete a menu, follow these steps:

1. Select the menu item you want to delete.
2. Choose Delete Item from the Menu menu.

4th DIMENSION removes the item from the Items list.

Previewing Custom Menus and Adding a Splash Screen

As you develop your runtime application, 4th DIMENSION lets you view the custom menus and menu bars as they will appear in the application.

While previewing a menu bar, you can also embellish each menu bar with a “splash screen,” a custom graphic displayed under the menu bar when it appears. A splash screen can include a company logo or other design elements.

Before you can add a splash screen, you need to do two things:

- Create the graphic using a Macintosh graphics application, by scanning, or by some other means.
- Copy the graphic into your Scrapbook.

To preview the menu bar and add a splash screen, follow these steps:

1. Choose Show Custom Menus from the Menu menu.

4th DIMENSION displays the menu bar as it will appear in the custom application and prompts you to copy a picture to accompany the menu bar.

Figure 7-7 shows a menu bar being previewed.



Figure 7-7
Custom menu bar

2. Open the menus listed on the menu bar to preview the contents of the menus.

3. If you are going to add a splash screen, copy the graphic from the Scrapbook and paste it into the Splash Screen area.

4th DIMENSION centers the graphic image beneath the menu bar. Figure 7-8 shows an example of a custom splash screen.

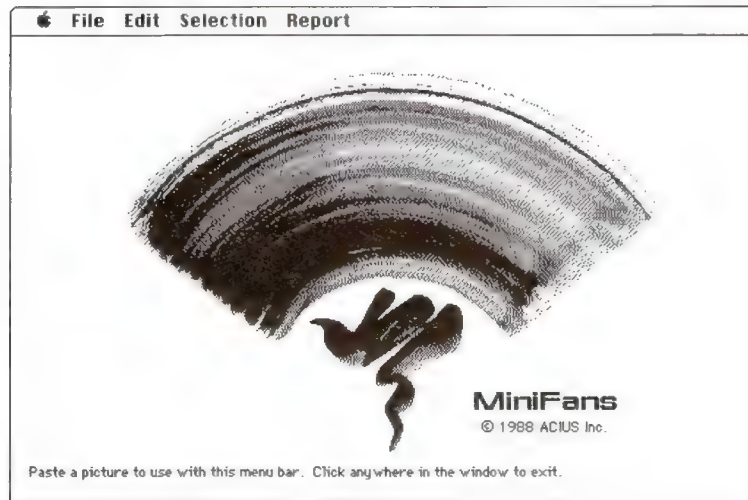


Figure 7-8
Custom splash screen

4. When you are satisfied with your splash screen, click anywhere in the screen to exit the preview.

The splash screen will appear whenever this menu bar is used in the runtime application.

Menus and Runtime Applications

Menu bars provide the major interface for runtime applications. For each runtime application, you must create at least one menu bar with at least one menu. See the *4th DIMENSION Language Reference* for more information on creating runtime applications.

why use a language L4

Menu Bar #1 is by default the menu bar that is displayed in the Runtime environment. You can change the menu bar with the language.

QUIT

If you define a menu item without assigning it a procedure, choosing that item causes the application to quit. If you are using the full 4th DIMENSION application and do not have a password system, quitting from the Runtime environment returns you to the User environment. A password system can be set up to control where each user is placed when quitting from the Runtime environment. If you are using the application with 4th DIMENSION Runtime, quitting takes you to the Finder.

MANAGING PASSWORD ACCESS

CHAPTER 6



MANAGING PASSWORD ACCESS

This chapter provides information about 4th DIMENSION's Password Access editor. If more than one person uses a database, you may want to provide different kinds of access to the database. If you are designing applications for use in a multi-user environment, it is essential that you provide security for sensitive data by assigning passwords to users and creating access groups that have different levels of access to information in the databases or database operations.

Use the Password Access editor to

- specify users of an application or database
- provide users with passwords
- create groups of users with different levels of access to the database or application
- nest groups of users within other groups to create a hierarchy of users

After you create access groups, you can manage access to

- input and output layouts
- database files
- procedures
- menu commands

In addition to providing security for your applications and databases, the access system also maintains a user history—the Password Access editor can tell you how many times a user has used the database and the date of the most recent use.

Access System Overview

4th DIMENSION's password access system is based on *users* and *groups*. You assign passwords to users. You assign users to groups, and you assign each group access rights to appropriate parts of the database.

Figure 8-1 shows file access rights being assigned to various groups.



Figure 8-1
Assigning access privileges

A user types the password to open the database. Then, depending on which groups the user belongs to, and which parts of the database the groups have been assigned to, the user can operate the parts of the database that his group membership allows.

Figure 8-2 shows the Password dialog box for the user to enter a password when opening a database.



Figure 8-2
Opening a database with a password

The user operates the database in a normal fashion. When the user attempts to use a layout, menu item, procedure, or file that the group is not permitted to use, 4th DIMENSION displays an error message, shown in Figure 8-3 on top of the following page.

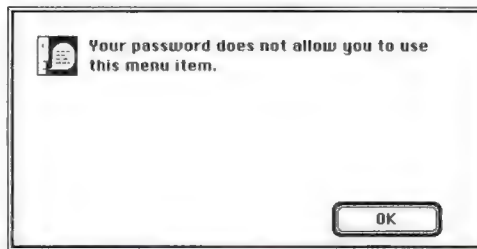


Figure 8-3a
Access error for menu items and layouts

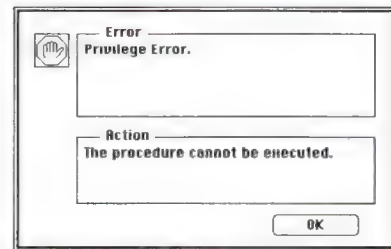


Figure 8-3b
Access error for procedures and files



Note: If an ON ERR CALL procedure is installed, the error message for procedures and files is not displayed. See the *4th DIMENSION Language Reference* for more information.

An Access Hierarchy Scheme

The best way to ensure the security of your database and provide users with different levels of access is to use an access hierarchy scheme. This section discusses some approaches to such a scheme.

Users can be assigned to appropriate groups, and groups can be nested to create a hierarchy of access rights. An example of an access hierarchy is shown in Figure 8-4.

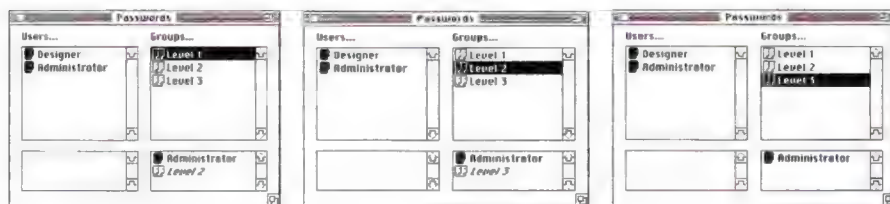


Figure 8-4
An access hierarchy

In this example, a user is assigned to one of three groups, depending on the user's responsibility. Users assigned to group Level 1 are responsible for data entry. Users assigned to group Level 2 are responsible for maintaining the data, including updating records and deleting outdated records. Users assigned to group Level 3 are responsible for analyzing the data, including performing searches and printing analytical reports.

The groups are then nested so that privileges are correctly distributed when the groups are assigned. Level 3 contains only high-level users. Level 2 contains data maintenance users, as well as Level 3 users, so that the users in Level 3 have the privileges of Level 2 as well. Level 1 contains data entry users, as well as Level 2 users, so that users who belong to Level 2 and Level 3 enjoy the privileges of Level 1 as well.

You can decide which group to assign access privileges to based on responsibility. If you assign group Level 1 to a menu item, for example, it means that everyone can use this menu item. If you assign group Level 2 to the menu item, it is restricted to members of Level 2 and Level 3. If you assign group Level 3, only members of Level 3 can use the menu item.

Such a hierarchical system makes it easy to remember which group to assign a new user. You only have to assign each user to one group, and you use the hierarchy of groups to determine access.


As part of designing your access system, another consideration to keep in mind is the level at which a user should be restricted. You can think of each of the parts of a database to which access can be controlled—menu items, procedures, layouts, and file operations—as being part of a natural hierarchy. For example, if only a file is restricted, a user may get through the menu that calls a procedure that displays a layout only to be restricted at the file level.

Here is the general order of restriction:

1. Menu item.
2. Procedure.
3. Layout.
4. File operation.

Your access scheme should restrict access at the highest appropriate level, usually at a menu item.

One useful approach avoids the need for groups altogether: You can create a menu bar for a specific user that contains unrestricted menus appropriate for his or her needs. You can then create a startup procedure that assigns that menu bar to that user. When you add the user to the password access system, you can specify the startup procedure to execute when that user opens the database.

 **Important:** If you allow users to have access to the User environment, it is important to assign access privileges to procedures, layouts, and files in the database. Normally, the User environment allows unrestricted access to procedures, layouts, and files.

Users' Access to Environments

4th DIMENSION provides users with certain standard access privileges to the three environments and certain powers within each environment. Once a password access system has been initiated, these standard privileges take effect.

The most powerful user is named Designer. When the Designer opens the database, it opens in the environment specified in the Preferences dialog box. The Designer has control over the design of the database. The Designer can create user groups, assign access privileges to groups, and use the Design environment. No aspect of the database is closed to the Designer. The Designer can use the Design environment, User environment, and Runtime environment. Menus, layouts, procedures, and files that have limited access are open to the Designer.

After the Designer, the next most powerful user is the Administrator. When the Administrator opens the database, it opens in the User or Runtime environment, depending on the environment specified in the Preferences dialog box. The Administrator can have access to both the User and Runtime environments. Using the language, the Administrator can be given the power to add users and groups, assign and change passwords, and assign users to groups. The Administrator's access to the database is limited by group membership. The Administrator is placed in every new group, but you can remove the Administrator's name from the group.

All other users are ordinary users. When a user opens the database, it opens in the User or Runtime environment, depending on the environment specified in the Preferences dialog box. A user can have access to both the User and Runtime environments. Users' access is limited by group membership.

You can restrict a user to the Runtime environment by creating a startup procedure. You can assign a startup procedure to any user. Any entry in the "Startup procedure" box, even a dummy entry that has no actual procedure to execute, restricts a user or Administrator to the Runtime environment. The Designer's access to environments is not affected by a startup procedure.

Group Owners

You can designate an owner for each group. Usually, the owner is the Administrator, but you can designate any group member as the owner.

The group owner can be given the ability to add users to the group and remove users from the group. The users to be added must already exist. Group owners cannot create users, or create or change user passwords.

Group owners can add and remove individual users only. Group owners cannot add or remove other groups from the group.

Guests

4th DIMENSION makes a provision for opening a database without a password. As a guest, any user can open a database without a password and can operate any part of the database that is open to all groups.

If all users have passwords, a guest is limited to the Runtime environment. A guest can view data, display layouts, and use any menu items that are not protected by access groups.

Using Startup Procedures

A startup procedure can be assigned to each user. The startup procedure executes each time the user opens the database. You can use a startup procedure to

- restrict a user to the Runtime environment
- display a personalized message
- display a menu bar other than Menu Bar #1
- do special initialization

Initiating the System

You initiate the 4th DIMENSION password access system by assigning a password to the Designer.

Until you give the Designer a password, 4th DIMENSION allows anyone to use any part of the database.

When a password is assigned to the Designer, all the access privileges you have assigned to files, layouts, menus, and procedures take effect. In order to open the database, users must enter a password, or accept guest status.



Warning: Do not forget the Designer's password. If you do, you will be unable to open the database in the Design environment.

Assigning Users and Groups

You use the Password Access editor to create access groups and assign passwords to users.

To open the Password Access editor, choose Passwords from the Design menu.

4th DIMENSION opens the Password Access editor, shown in Figure 8-5.



Users list

Groups list

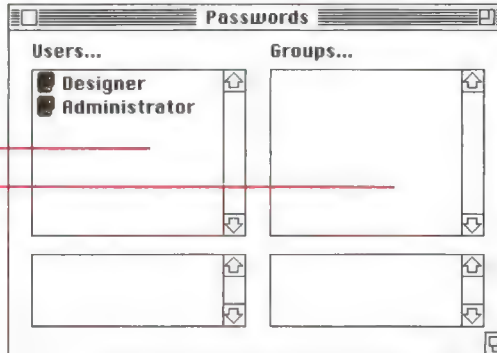


Figure 8-5
The Password Access editor

The Password Access editor displays four scrollable areas. The upper Users list displays user names. The users designated Designer and Administrator appear at the top of the list. The lower Users list displays the names of any groups a selected user belongs to.

The upper Groups list displays the names of access groups. The lower Groups list displays the names of users who belong to a selected group.

When the Password Access editor is active, the Passwords menu is available.

You use the commands on this menu to add users and groups.

Adding Users and Passwords

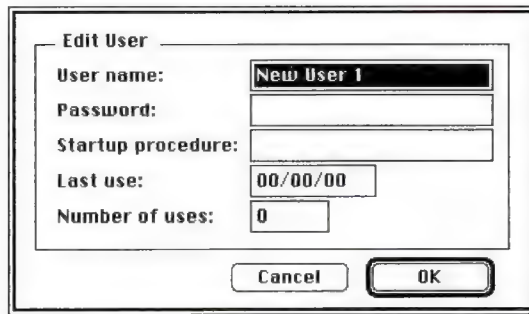
When you add a user and assign a password, you can also specify a startup procedure to perform a special operation when the user opens the database.

To add a user and assign a password, follow these steps:

1. Choose New User from the Passwords menu.

4th DIMENSION displays the Edit User dialog box, shown in Figure 8-6.





The image shows a dialog box titled "Edit User". It contains several input fields: "User name:" with the text "New User 1", "Password:" (empty), "Startup procedure:" (empty), "Last use:" with the date "00/00/00", and "Number of uses:" with the value "0". At the bottom right, there are two buttons: "Cancel" and "OK".

Figure 8-6
Edit User dialog box

The dialog box provides areas for entering a user name, a password, and the name of a startup procedure. In addition, the Designer or Administrator can view information about an individual's use of a database or database application.

2. Type a new user name.
3. Type a password for the user.

You can use up to 15 alphanumeric characters for a password. The Password Access editor is case sensitive—the user must enter the password *exactly* as it is entered in the Edit User dialog box. For example, if you define a user's password as "alPHa", the user must enter it with a capital P and capital H, or 4th DIMENSION will not accept the password.



Note: After you specify a user password, that password is not available for view the next time you open the dialog box. Asterisks display in place of the password characters.

4. If you wish, enter the name of a startup procedure for the user.

For a startup procedure to execute, you must create a global procedure with the name you assign. See Chapter 6 for information about creating a global procedure. For information about using 4th DIMENSION's language, see the *4th DIMENSION Language Reference*.

If you assign a startup procedure for the user, 4th DIMENSION executes that procedure every time the user opens the database. To restrict a user to the Runtime environment, specify a dummy startup procedure name, such as X.

5. Click OK to save the user information.

To change user names and passwords, follow these steps:

1. Select the user name in the list of users and choose Edit User from the Passwords menu. Or double-click the user name.

4th DIMENSION displays the Edit User dialog box.

2. Make the modifications you want in the dialog box.
3. Click OK to save the changes you made to the user profile.

Creating Access Groups

When you create a group, you can designate a group owner from among the users.

To create a group, follow these steps.

1. Choose New Group from the Passwords menu.

4th DIMENSION displays the Edit Group dialog box, shown in Figure 8-7.

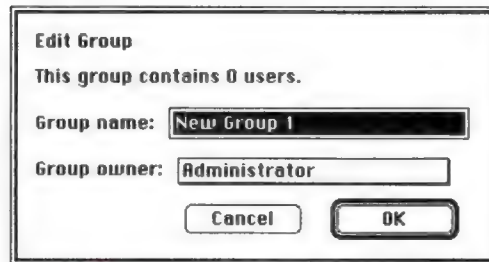


Figure 8-7
The Edit Group dialog box

2. Enter a group name in the Group Name box.
The group name can be up to 15 characters in length.
3. Click on the Group Owner box and select a user from the pop-up menu of users.

The group owner can add users to and remove users from the group.

4. Click OK to add the group to the access system.

The name of the new group appears in the group list.

To change access groups, follow these steps:

1. Click the group name in the list of groups and choose Edit Group from the Passwords menu. Or double-click on the group name.

4th DIMENSION displays the Edit Group dialog box.

2. Enter a new group name or specify a new group owner in the dialog box.



3. Click OK to save the changes you made to the group.

Assigning Users to Groups

You can assign users to any group. You can assign a user to several access groups. You are not required to assign a user to a group.

To assign a user to a group, drag the user name from the Users list over the name of the desired group in the Groups list, then release the mouse button.

Figure 8-8 shows a user name being added to a group.

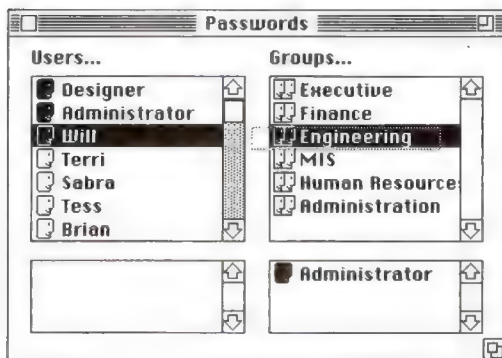


Figure 8-8
Assigning a user name to a group

The user name appears in the lower Groups list of users assigned to the selected access group. The group name appears in the lower Users list of groups assigned to a selected user. The assigned user now has all the privileges that you provide that group.

Click any group name to see a list of users who belong to that group.

Removing Users from Groups

To remove a user from an access group, follow these steps:

1. Click the group name in the upper Groups list to view the names of users assigned to the group.
2. Drag the user name from the lower Groups list to the Users list and release the mouse button.

The user name disappears from the list of users assigned to the selected group. The user no longer enjoys the privileges that you provide that group.

Nesting Groups

To create a user hierarchy, you nest groups, placing one group within another group. The users of the nested group obtain the privileges of both groups. For example, if you nested the group Lapis inside the group Emerald, users assigned to the Lapis group would automatically get the privileges of Emerald in addition to the privileges accorded the Lapis group. However, users inside Emerald are denied access to the privileges of the Lapis group—they have only the privileges assigned to Emerald.

For further explanation of how a hierarchical access system works, see “An Access Hierarchy Scheme,” earlier in this chapter.

To assign a group to another group, drag the group name from the list of groups over the name of the group whose privileges you want it to assume, and release the mouse button. Figure 8-9 shows a group being added to another group.

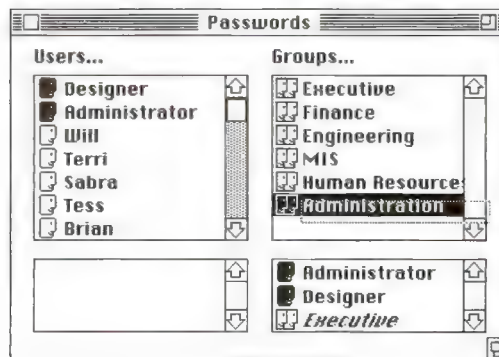


Figure 8-9
Dragging a group name

The nested group name appears in italics in the list of users assigned to the selected group. In addition to its assigned privileges, the nested group now has all the privileges of the group it has been placed in.

Removing Nested Groups

To remove a group from another group, follow these steps:

1. Select the group name in the upper Groups list, to display the names of users and groups assigned to the group.
2. Select the group name in the lower Groups list, drag the name to the Users list, and release the mouse button.

The group name disappears from the list of users for the selected group.

Saving and Loading Groups

4th DIMENSION allows you to save and load groups. When groups are saved, everything about the current users and groups are saved. Later, when loaded again, the original users and groups are installed.

The ability to save groups means that you can preserve the access system of one database and transfer it to a modified version of the same database or to a new database. The users of the database do not have to learn an entirely new access system. All the user names, passwords, startup procedure names, groups, group owners, and group memberships are preserved.

To save the current groups, choose Save Groups from the Passwords menu.

4th DIMENSION provides a “create-file” dialog box so that you can name and save the group.

To load groups, choose Load Groups from the Passwords menu.

4th DIMENSION displays a File Directory dialog box so that you can open the Groups file.

Assigning a Group to Menus, Procedures, Layouts, and Files

After you define users and access groups, you can assign groups to menu items, procedures, layouts, and file operations.

You may assign only one group to a menu item, procedure, layout, or file operation. For this reason, it is important to design the access groups so that more powerful users belong to all the groups below them in the access hierarchy.

See “An Access Hierarchy Scheme,” earlier in this chapter for a discussion of how to organize users and access groups.

Assigning a Group to a Menu Item

When you assign a group to a menu item, only users belonging to that group can use that menu item.

To assign access privileges, follow these steps:

1. Choose Menu from the Design menu.

4th DIMENSION displays the Menu Bars dialog box.



2. Select the menu bar that contains the menu and menu item you want to assign an access group to, and click OK.

4th DIMENSION displays the Menu editor.

3. Select the menu item you want to assign an access group to.
4. Choose the group from the Access pop-up menu.

Figure 8-10 shows a group being assigned to a menu item.

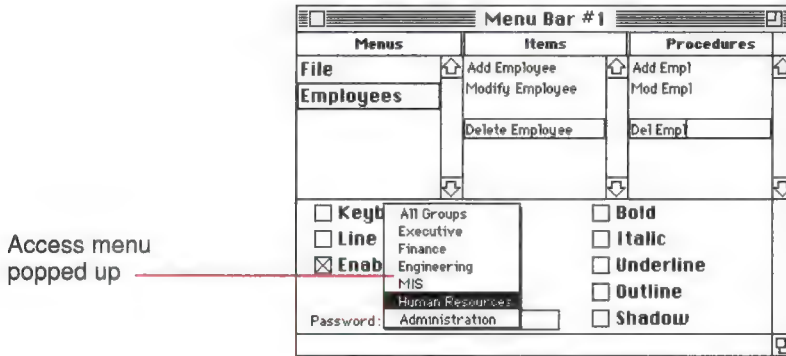


Figure 8-10
Assigning a group to a menu item

5. Click the close box to close the Menu editor.

Assigning a Group to a Global Procedure

When you assign a group to a global procedure, only users belonging to that group can use that procedure.

To assign access privileges, follow these steps:

1. Choose Procedure from the Design menu.
4th DIMENSION displays the Procedure dialog box.
2. Expand the Global procedures in the Procedures list until you see the procedure you want to assign to an access group.
3. Select the procedure you want an access group assigned to.
4. Choose the group from the Access pop-up menu.

Figure 8-11 shows a procedure being assigned to a group.



Access menu
popped up

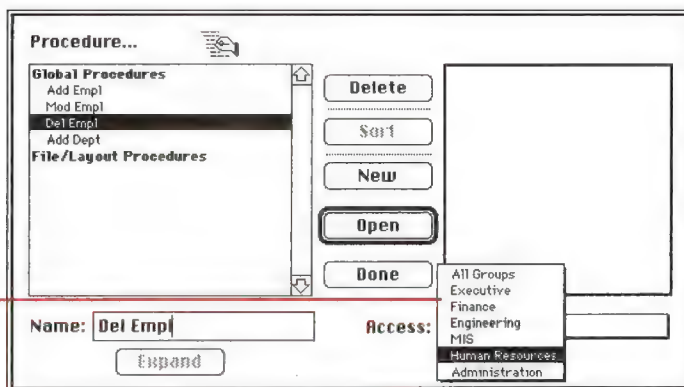


Figure 8-11
Assigning a Group to a Procedure

5. Click Done.

Assigning a Group to a Layout

When you assign a group to a layout, only users belonging to that group can use that layout for data entry.

To assign access privileges, follow these steps:

1. Choose Layout from the Design menu.
4th DIMENSION displays the Layout dialog box.
2. Expand the filename that contains the layout.
3. Select the layout you want to assign an access group to.
4. Choose the group from the Access pop-up menu.

Figure 8-12 shows a group being assigned to a layout.

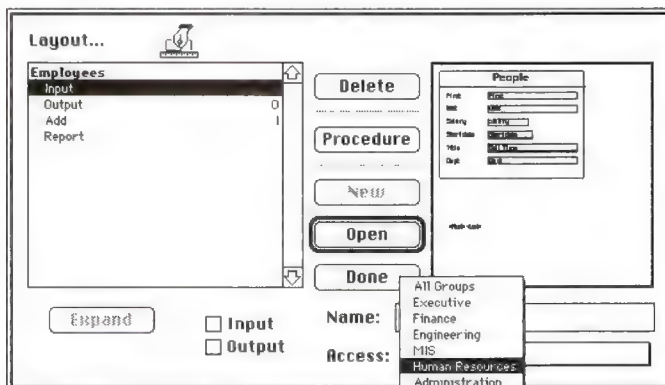


Figure 8-12
Assigning a group to a layout

5. Click Done.

Assigning a Group to File Operations

You can assign different groups to each of the four file operations. You can thus specify which groups can load, save, add, or delete records from a file. These privileges can be very sensitive for some applications.

You can allow some users the right to add records, without being able to load and view any other records. You can allow others the right to modify records, but not add any new ones.

To assign access privileges to a file, follow these steps:

1. In the Structure window, select the file image of the file you want to protect.
2. Choose Rename File from the Design menu.

4th DIMENSION displays the File Attributes dialog box, as shown in Figure 8-13.



Pop-up menus for assigning access groups



Figure 8-13
File Attributes dialog box

Here are the file operations that groups can be assigned to:

- **Load** allows users to load records and view them. It does not provide the right to modify records, create new records, or delete records.
- **Save** allows users to save modified records. It does not provide the right to load records, add new records, or delete records.
- **Add** allows users to create new records. It does not provide the right to load records, modify existing records, or delete them.
- **Delete** allows users to delete records. It does not provide the right to load records, modify existing records, or add new records.

3. Choose a group for each action from the pop-up menus.

You must provide Load privileges for any group that has Save, or Delete privileges.

4. When you have finished, click OK.

System Maintenance

Once a password access system is in place, occasional maintenance of the system is necessary. Users must be added, groups need new members, and passwords need to be changed. The Designer can create a procedure that allows the Administrator to have control over users and groups, and each group owner to have control over members of his or her group.

The Administrator and the Designer can also view the usage history of each user as necessary for maintenance.

Administrator and Group Owner Procedure

The Administrator does not have access to the Design environment. However, if the Designer creates a global procedure that contains the command EDIT ACCESS, the Administrator and group owners can have limited power to control users and groups.

The EDIT ACCESS command can be made part of a procedure placed in a custom menu in the Runtime environment, or the procedure can be executed with the Execute Procedure command from the User environment. If the procedure is executed by a user who is not the Administrator or another group owner, it has no effect.

When the procedure is executed, the result depends on whether the user is the Administrator or a group owner.

If the Administrator executes the procedure that contains the EDIT ACCESS command, 4th DIMENSION displays the Password Access editor.

The Administrator can create and edit groups; create users; edit user information, including changing passwords; assign users to groups; and remove users from groups. Essentially, the Administrator has complete control of the Password Access editor and can make changes as necessary.

The Administrator cannot assign groups to layouts, files, menu items, or procedures. Only the Designer can assign these access groups.

If a group owner who is not the Administrator executes the procedure that contains the EDIT ACCESS command, 4th DIMENSION displays the Password Access editor, but displays only the groups that the group owner owns. The group owner can add users to the groups, and remove users

Special

Edit Output ASCII Map...
Edit Input ASCII Map...

Execute Procedure... %E

from the groups. The group owner cannot create users, edit user information, or add groups. The menu commands for adding and editing users and groups are dimmed.

Viewing Usage

The Edit User dialog box contains the date of the user's last use of the database, and the total number of uses. The Administrator or Designer can view this information by opening the Edit User dialog box for any user.

To open the Edit User dialog box, follow these steps:

1. Choose Passwords from the Design menu. Or execute the procedure that contains the EDIT ACCESS command.

4th DIMENSION displays the Password Access editor.

2. Select the user name you want to see from the Users list, and choose Edit User from the Passwords menu.

The Edit User dialog box displays the date of the user's last use of the database, as well as the number of times the user has opened the database, as shown in Figure 8-14.



The 'Edit User' dialog box displays the following information:

User name:	Designer
Password:	*****
Startup procedure:	Initialize
Last use:	6/27/88
Number of uses:	56

Buttons: Cancel, OK

Figure 8-14
Sample user profile

CREATING LISTS

CHAPTER 9



CREATING LISTS

This chapter tells you how to create and use lists. A list is a set of possible values for a field or enterable object. You can use a list to

- provide the user choices from which to select an entry for a field or enterable object
- restrict the valid entries to those in the list
- exclude the entries in the list from being entered

When a list is used as a choice list for a field or enterable object, the user can simply select from the list instead of typing the entry. For example, you may want to create a choice list for entering job titles in a personnel database.

You can also use lists to provide restrictions on data entry. One list may provide the required values for a field, excluding all others. Another list may provide the excluded values for a field, preventing any value in the list from being entered.

Your lists can offer up to 8,000 choices in a single database, and each choice can contain up to 30 characters.

For information about adding a choice list to a field as a field attribute, see “Field Attributes,” in Chapter 2. For information about using lists with data entry controls, see “Data Entry Controls,” in Chapter 4. You can also use lists to store arrays. For complete information, see the *4th DIMENSION Language Reference*.

You create all 4th DIMENSION lists with the List editor. You use the List editor to

- create lists
- add items to lists
- delete lists
- delete items from a list
- sort items in a list
- set a list as modifiable

Designing Lists

The basic purpose of a list is to provide the user with a list of values from which to choose during data entry. Here are some considerations about lists that stem from this basic purpose:

- You can make a list available for every layout, or just for selected layouts.
- If the list has many items, you can divide it into two or more lists.
- If there are very few items, you may want to dispense with a list altogether.
- You can restrict the possible entries to those in the list, or you can allow the user to type additional entries.
- You can allow the user to modify the list, or you can prevent the user from modifying the list.

You can attach a list to a field, as one of the field attributes. Attaching a list to a field causes the list to appear whenever that field is selected during data entry. The user can select an entry from the list. If the list is sorted, the list automatically scrolls as the user types characters at the keyboard. The user can stop typing when the desired choice appears, and select it from the list.

Or you can attach the list to the field as a data entry control in a layout, instead. The list will appear only when the field is selected in this input layout, not in all layouts.

Figure 9-1 shows a choice list displayed during data entry.

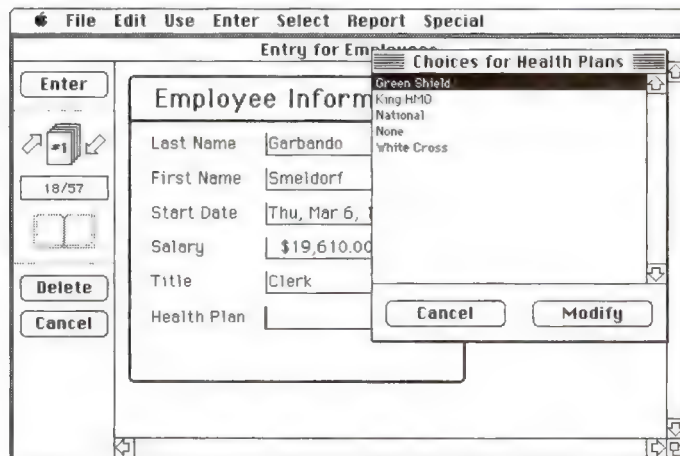


Figure 9-1
A choice list for data entry

Some lists are actually too short to bother with. For example, if you keep track of the sex of your employees, you could create a list with two entries, “Male” and “Female.” But this is the kind of information that is best stored in a Boolean field and entered by clicking a radio button. Even three or four choices can usually be handled with check boxes in a layout.

Some lists are so long and dull that they don’t work as choice lists at all. Using a list of zip codes for an address file might work well for one small city, but using a list for all United States zip codes would take more time than typing the zip codes.

Linked Lists

4th DIMENSION allows you to link an item in a list to another list. Selecting such an item displays the linked list.

How you use linked lists depends on circumstances. For example, a list of abbreviations for states would include 50 entries. You can link lists of these entries in various ways.

You can often divide one list into two lists. If you find that 80% of the entries for the State field are the same few states, you can put those states in one list and place the remainder in another list, as shown in Figure 9-2.

Select any of these states to enter in field

Select More Staets to display another list with all the other states

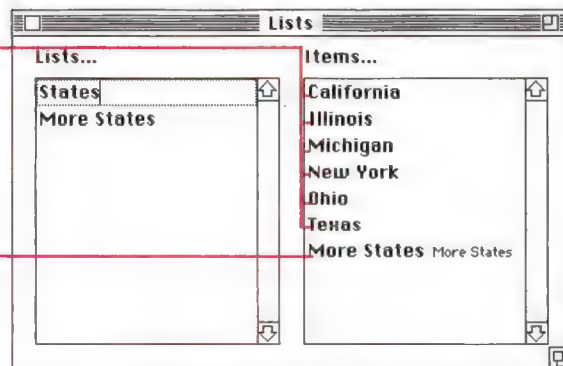


Figure 9-2
Divided lists

With such a divided list, the user can usually select the entry from the first list. When another state is required, the user simply clicks More States, and another choice list appears that contains the remaining states.

Another solution is to nest lists, using a master list with subordinate lists. For example, you could divide the states into different regions. The first list that appears provides choices for each region. The subordinate lists contain the states for each region, as shown in Figure 9-3.

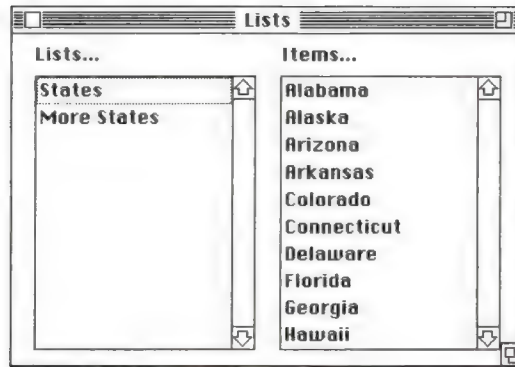


Figure 9-3
Nested lists

With such nested lists, the user makes two choices: first to select the regional list, then to select the state in that region. Each subordinate list could include a choice to return to the list of regions.

Finally, you can link lists in such a way that you can go from any list to any other. Suppose you need a Western-region state 35% of the time, and you often need states from the other regions also. You can link all four regional lists, as shown in Figure 9-4.

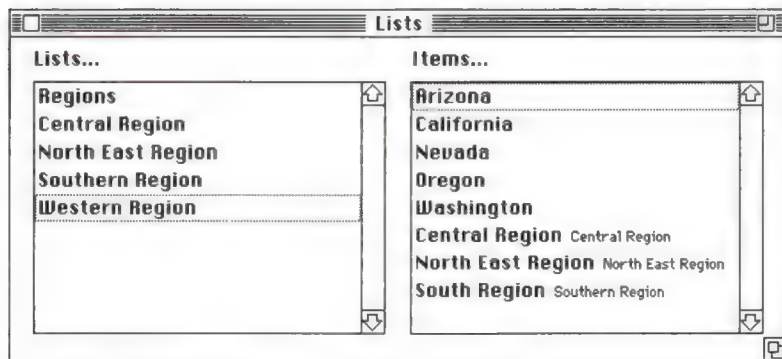


Figure 9-4
Interlocking lists

Since the Western list is attached to the field, it appears when the field is selected. The user can then go to any of the other lists if necessary. The user can go from any list to any other and back again because each list is linked to the others.

Required and Excluded Values

Some data entry tasks are somewhat informal. If you enter a value that does not appear in a list, it may be perfectly all right. However, you may have an application in which an entry must be one of the values in a list.

Any different value would cause a serious consequence, such as delays in paying bills.

4th DIMENSION allows you to make a list required as part of the data entry controls on a layout. This type of data entry control prevents a user from entering any value other than the ones in the list. For example, your company may have a specific group of job titles that are allowable in a personnel database.

Another data entry control makes it possible to exclude the values in a list. The user then cannot type in a value that should not appear in the field. For example, your company may be prevented from doing business in certain countries. Placing them in an excluded list prevents them from being entered.

Non-sequential Ranges of Values

One of the most useful data entry controls is the Maximum and Minimum setting for a number, date, or time field. Setting a maximum and minimum prevents a user from entering a value outside this range.

But suppose you have three acceptable ranges for the field. You can use a list to create such non-sequential ranges. If you then make this list required for a field, values outside the three ranges are not accepted.

Figure 9-5 shows a list of ranges.

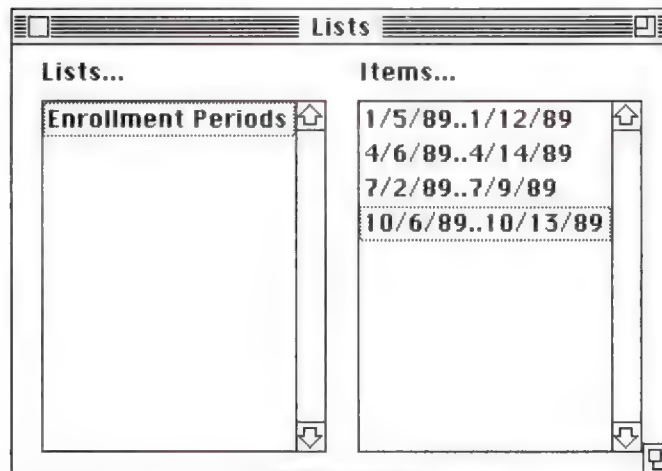


Figure 9-5
Using a list for non-sequential ranges

Conversely, you could create a list that specifies the ranges that are *not* valid. If you then make this list an Excluded list for a field, any entry within the ranges is not accepted.

Creating Lists

You create lists with the List editor. You can modify any list at any time by returning to the List editor and making changes.

To open the List editor, choose Lists from the Design menu.

The List editor appears, as shown in Figure 9-6.



List of lists

List of items

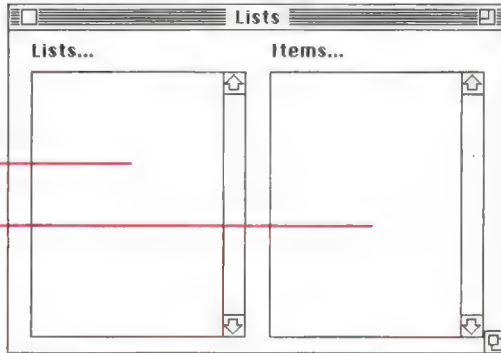


Figure 9-6
The List editor

The List editor displays the names of existing lists on the left. On the right side of the editor, a list of items in the selected list is displayed. The menu bar provides two menus, Lists and Items.

To view the items available in a list, select the list name in the Lists column.

The items in the selected list appear in the Items column.

To create a new list, follow these steps:

1. With the List editor window open, choose New from the Lists menu.
4th DIMENSION creates an empty frame in the Lists column and displays an insertion point in the frame.
2. Type the list name.

You have created a new empty list. You still have to create the items that will appear in the list, as described next.

Adding Items to Lists

When you are adding items to a list, you can append new items to the end of the list or insert them anywhere in the existing list.



To append items to a list, follow these steps:

1. Select the name of the list to which you want to add items.

If the list already contains items, they appear in the Items column.

2. Choose New from the Items menu.

4th DIMENSION creates an empty frame in the Items column and displays an insertion point in the frame.

3. Type the item name.

Figure 9-7 shows an item being entered.

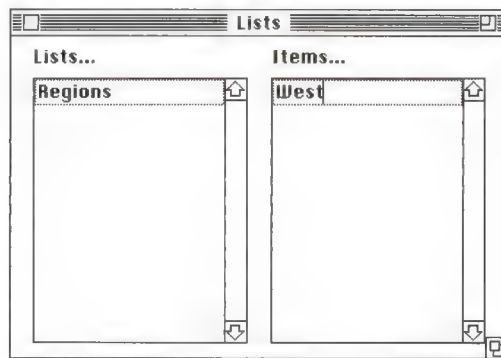


Figure 9-7
Entering an Item in a list

4. To add more items to the list, choose New from the Items menu to open an empty frame in the Items column. Or press Return to open an empty frame in the Items column.
5. When you have finished, click the close box to save the current lists and close the editor window.

To insert an item in a list, follow these steps:

1. Select the item that is to appear below the item you are adding.

4th DIMENSION inserts the new item above whichever item is currently selected. This allows you to insert a new first item.

2. Choose Insert from the Items menu.

4th DIMENSION creates an empty frame in the Items column above the previously selected item.

3. Type the item name.
4. Click the close box to save the current lists and close the editor window.



Deleting Items and Lists

To delete an item, follow these steps:

1. With the List editor window open, select the list that contains the item you want to delete.
2. From the Items column, select the item you want to delete.
3. Choose Delete from the Items menu.

4th DIMENSION deletes the item from the list and removes the space it occupied in the list.

To delete a list, follow these steps:

1. With the List editor window open, select the list you want to remove.
2. Choose Delete from the Lists menu.

4th DIMENSION deletes the list and removes the space it occupied in the list.



Copying Lists

You can copy a list. You can then rename the copied list, modify it, and avoid having to retype many entries.

When you copy a list, you are copying the list name and all the items.

To copy a list, follow these steps:

1. Select the list you want to copy in the List column.
2. Choose Copy from the Edit menu.

4th DIMENSION copies the list and items to the Clipboard.

3. Choose Paste from the Edit menu.

4th DIMENSION pastes the list and its items into place.

Linking Lists

You can link any list to any other list. Typically, you create an item that names the list it displays.

To link one list to another, follow these steps:

1. Create at least two lists.

For this example, suppose the two list titles are List One and List Two.

2. Add “To List One” as an item in List Two.

“To List One” is the choice that will display List One.

3. Position the pointer over the “To List One” item and press and hold the Option key.

The pointer becomes a sideways-pointing marker.

4. Continue to hold down the Option key as you drag from “To List One” to the List One title, then release the mouse button.

Figure 9-8 shows the dragging operation.

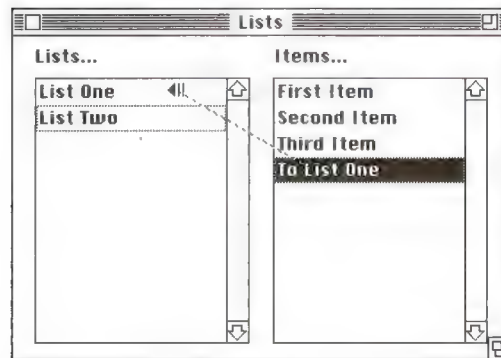


Figure 9-8
Adding a list as an item

4th DIMENSION displays List One in smaller type next to the “To List One” item. List One has been added to List Two. Whenever List Two is displayed, selecting the “To List One” choice displays List One.

To link lists to each other, follow these steps.

In the following example, List One and List Two become linked to each other.

1. Link List One to List Two as described earlier in this section.
2. Add an item to List One that reads “To List Two.”
3. Press the Option key as you drag from the “To List Two” item to the List Two title, then release the mouse button.

Figure 9-9 on the following page shows the dragging operation.

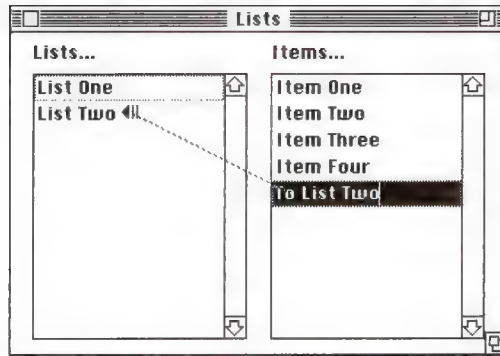


Figure 9-9
Adding another list as an item

4. Release the mouse button.

4th DIMENSION adds List Two to List One.

Now the two lists are linked to each other. List One has a choice that displays List Two; and List Two has a choice that displays List One.

Specifying Ranges in a List

4th DIMENSION allows you to enter ranges of numbers, dates, and times in a list. You can use these ranges as data entry validation ranges by making the list required or excluded in a layout.

To create ranges in a list, follow these steps:

1. Create the list you want to use for ranges.
2. For each item, enter the minimum value of the range, then two periods (..), then the maximum value.

For example,

100..150

defines the range between 100 and 150, inclusive.

Continue specifying ranges as separate items until you have defined as many as you need.

Sorting a List

4th DIMENSION maintains the list of items in the order in which you enter them. You can sort the list alphabetically so that entries are more easily accessible to database users. Since a sorted list automatically scrolls to match characters typed at the keyboard, sorting makes data entry easier.

To sort a list, follow these steps:

1. In the List editor, select the list that contains the choices you want to sort.
2. Choose Sort from the Items menu.



Making a List Modifiable

4th DIMENSION allows you to specify whether a list of items can be changed by the user. Whenever you create a list, it starts as modifiable. 4th DIMENSION places a check mark in the lists menu to show that the list is user modifiable.

If you allow a list to be user modifiable, the user has access to a special List editor in the User environment. The special List editor is for the assigned list only. The user cannot add lists, delete lists, or change any other list. If a list is modifiable, the user can make any change to that list's items.

Figure 9-10 shows the special List editor in the User environment.

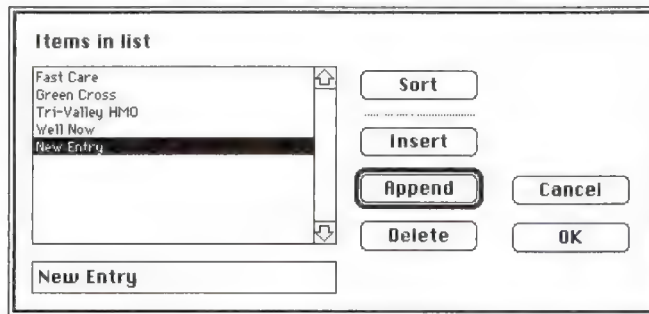


Figure 9-10
Special User environment List editor

In a multi-user environment, lists cannot be modified by the user.

To make the list user-modifiable, follow these steps:

1. Select the list that you want to make modifiable.
2. Pull down the List menu.

If the User Modifiable command has a check mark, the list is user modifiable. Release the mouse button without making a menu choice.

If the User Modifiable command does not have a check mark, go to the next step.

Figure 9-11 shows User Modifiable with a check mark.



Figure 9-11
Check mark shows list is user modifiable

3. Choose User Modifiable from the List menu.

4th DIMENSION adds check mark to the menu item. The list can be modified in the User environment.

To prevent the user from modifying a list, select the list and choose User Modifiable to remove the check mark.



4th DIMENSION SPECIAL TOPICS

4th DIMENSION SPECIAL TOPICS

This chapter provides guidelines for using 4th DIMENSION to best advantage under different circumstances. It describes

- how to specify the operating environment: single-user or multi-user
- how to update Structure and Data Files
- how 4th DIMENSION uses memory
- how 4th DIMENSION works under MultiFinder
- how to optimize 4th DIMENSION performance
- how to repair damage

Setting Single-User or Multi-User

4th DIMENSION needs to know whether to operate in a single-user environment or in a multi-user environment.

To set single-user or multi-user, follow these steps:

1. Start 4th DIMENSION, and while it is starting, hold down the mouse button.

4th DIMENSION displays the dialog box for setting single-user or multi-user, as shown in Figure 10-1.

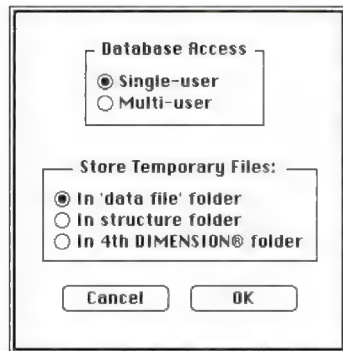


Figure 10-1
Dialog box for single-user or multi-user setting

You also use this dialog box to specify any preferred location for temporary files that 4th DIMENSION may create.

2. Select the appropriate button, and then click OK.

4th DIMENSION puts away the dialog box. Subsequently, 4th DIMENSION operates as you have instructed it until you change the setting again.

Changing this setting affects 4th DIMENSION itself, not just a particular database.



Note: In a multi-user environment, if one user is using the Design environment for a database, no other users can open that database.

Updating Structure and Data Files

You can make copies of updated versions of structure and data files to send to other users, or to preserve as backups. You might do this when you alter the structure with an editor in the Design environment, by creating new files, fields, layouts, and so on, or when new information has been added to a database.



Caution: Do not update either the data file or the structure file until you have made backup copies of both files and have stored the originals in a safe place.

The ability to update the structure file allows you to continue working on a database application after users have begun to use it. You can then substitute an improved structure for the original, giving the database new functionality.

To update a structure file, follow these steps:

1. Change the structure by using any of the editors in the Design environment.

The structure file contains all the specifications for the database structure (files, fields, field attributes), layouts, procedures, menus, password access groups, and lists.

2. Clone the structure file.

The new structure file is an updated version of the old structure file. You can send it to anyone who needs to use the new structure. It works with the data file that it created, a clone of that data file, or the old data file.

4th DIMENSION can use the old data file because it is tolerant of changes in structure. An updated structure can be used with an old data file even if you have added fields or files to the database. Be sure that any updated database follows these rules:

- The data file must have at least as many files as the structure.
- In the data file, each file must have at least as many fields as in the structure.

The structure file controls how the database operates; the data file follows any change in the structure file. You can change field types or attributes, including the Indexed attribute, at any time.

4th DIMENSION builds any new indexes when the User environment or Runtime environment is first used. For large databases, this can take some time. It happens only the first time a new index is added. Subsequently, the index is updated only when data is added or modified in the indexed field. 4th DIMENSION does not normally need to rebuild an index file.

The ability to update the data file allows you to distribute new data to all users that need it.

To update a data file, follow these steps:

1. Update the information, using 4th DIMENSION.
2. Duplicate the data file.

The new data file is an updated version of the old data file. You can send it to anyone who needs to use the new data. It works with the structure file that created it, or a clone of that structure file.

How 4th DIMENSION Uses Memory

4th DIMENSION requires memory for the program itself and for each record that it loads. The amount of memory that a record uses is dependent on the data that is stored in the record. For example, if the record contains the name and address of a person, the record may only be 100 bytes in size, but if the record contains a picture of the person, it may take 3000 bytes.

4th DIMENSION caches records to improve performance. When a low-memory condition exists, 4th DIMENSION compensates by swapping data to and from the disk. This swapping may cause some performance degradation in data access and screen refreshing. If you notice a performance degradation, you should allocate more memory to 4th DIMENSION.

Temporary files are created during the swapping operation. The temporary files are named "Temp1," "Temp2," and so on. If any are left on disk, you can throw them away. Such files remain only as a result of a power failure or similar mishap.



Note: For specific databases, precise memory configuration specifications for optimizing performance can be given. This should be done only by experienced designers. For information, see "4th DIMENSION Customizer" in the *4th DIMENSION Utilities* manual.

4th DIMENSION Under MultiFinder

4th DIMENSION is completely compatible with MultiFinder. No special setup is needed.

In order to optimize performance, you should allocate as much memory as possible to 4th DIMENSION.

4th DIMENSION can run in the background, performing such operations as printing, searching, sorting, or executing a procedure. Some operations give very little time to foreground programs, so you may experience some performance degradation in the foreground application. For example, if you use 4th DIMENSION to sort in the background, you may slow your word processing program.

Optimizing 4th DIMENSION Performance

To ensure that 4th DIMENSION works as effectively as possible, use a hard disk. 4th DIMENSION is designed to work with a hard disk. It is unlikely that you will achieve satisfactory performance with a floppy drive.

If you are going to purchase equipment specifically in order to increase 4th DIMENSION's performance, you should keep the following facts in mind.

For single-user systems:

- CPU speed is the most important consideration.
A Macintosh II, IIx, or IIfx, or an SE with an accelerator card improves 4th DIMENSION's performance. An SE 30 has an improved SCSI bus transfer rate that makes it work as fast as a Macintosh II.
- Additional memory improves performance.
RAM caching is not necessary. For optimum performance, turn RAM caching *off* in the Macintosh Control Panel. 4th DIMENSION provides its own data cache.
- A faster hard disk improves performance.
4th DIMENSION regularly loads and saves to disk. Hard disk speed can greatly affect performance.

For multi-user systems:

- The network speed is the most important consideration.
Faster networks such as EtherTalk can greatly improve performance.
- The file server performance affects 4th DIMENSION performance.
The file server is a CPU with a storage device. The same considerations that affect single-user systems affect the file server for multi-user systems.

Repairing Damage

4th DIMENSION features automatic database repair. 4th DIMENSION detects any data damage and warns you of its existence. Typically, when any damage has occurred, only one record is damaged. You can choose one of the following options:

- Delete the damaged record.
- Ignore the damaged record.

4th DIMENSION automatically marks the damaged portion of the disk and subsequently avoids using that portion.

After encountering damage, 4th DIMENSION may need to rebuild its index table. For some databases with large data files, this operation can take some time.

Only data files can be repaired. You should retain backup copies of your structure files, as they cannot be repaired.

Occasionally, damage to a data file may be so extensive that you must use the 4th DIMENSION Utilities provided in your package. For information about using the Utilities, see the *4th DIMENSION Utilities Guide*.

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Handwritten notes and markings along the right margin, including the word "Handwritten" and various illegible scribbles.

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